ELECTRONIC PORTFOLIOS: TOOLS FOR SUPPORTING THE TEACHER'S NEED FOR ASSESSMENT AND THE STUDENT'S NEED FOR DEEP LEARNING

by

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Abstract

The purpose of this thesis was to examine the question "Can electronic portfolios be used to support the teacher's need for assessment and the students' needs for deep learning?"

Students (n=12) in a grade 11/12 Comparative Civilizations course built electronic portfolios. One was a working portfolio and the other was a showcase portfolio. All assignments were assessed and stored in their working portfolios. Students then selected work that they believed best met the prescribed learning outcomes for the course and stored this work in their showcase portfolios.

Quantitative data gathered from a five-point Likert scale questionnaire, and qualitative data extracted from a personal reflective journal, interviews with six students, and student written comments on self-evaluations forms. The data revealed that electronic portfolios can be used to support both the teacher's need for assessment and the students' need for deep learning.

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CHAPTER ONE: INTRODUCTION

In recent years a significant amount of literature has been written about the value of both paper and electronic portfolios (e.g., Barrett, 2007; Brown, 2002; Falls, 2001; Heath, 2005) for educational use. In elementary schools, secondary schools, and post-secondary institutions students are creating portfolios for the purpose of supporting their learning and the institutions' needs for assessment (Michelson & Mandell, 2004). As a parent, I attend student-led conferences at my children's school during which my children take me through portfolios of their best work. In 2004, the Ministry of Education in British Columbia implemented a new graduation program, in which students in Grades 10, 11, and 12 built graduation portfolios, which presented their learning from the classroom and community. These portfolios have become more simplified over the last few years; however, their construction still requires Grade 12 students to compile evidence of classroom and community learning, reflect on this learning, and set future goals. Graduates then share this evidence with academic counselors. Medical students from the University of British Columbia (UBC) and the University of Northern British Columbia (UNBC) as well as Education students from UNBC create and maintain electronic portfolios as part of their graduation requirements. This chapter presents the rationale for choosing to examine the use of electronic portfolios in a secondary classroom, the research questions, the limitations and delimitations, and defines key terminologies used throughout the study.

I chose to investigate the use of electronic portfolios for qualitative assessment of student learning in a Western Civilizations 11/12 class. As a high school teacher, I am

faced daily with the pressures of presenting summative assessment of student learning. Students, parents, and administrators all want this information. To meet the demands for summative assessment, I teach a lesson and assign students work based on that lesson. Then I read their work, give it a numerical grade, record that grade in my grade books, one of which is paper and the other electronic, and hand back their work. Once every two weeks, progress reports are sent home, and twice in each semester report cards are mailed home. When the assignments have survived the purpose of generating marks, I witness students' throwing these assignments out or stuffing them in the back of their note books. This disregard for assessment raises to two key questions: Is most of their work fit only for the garbage when it no longer serves the purpose of gaining marks?, and is the quantitative data in my mark book an adequate measure of what these students have learned?

The purpose of this thesis was to examine how qualitative assessment in the form of electronic portfolios could be conducted to engage students in their learning. Additionally, it was proposed that the students would gain knowledge and experience that would be carried with them into the following years to support their learning.

Students in My Secondary School

The secondary school in this small town is a traditionally-structured school housed in a relatively new building with basic computer and shop facilities. The building does not reflect native culture in design or decoration. There are approximately 450 students enrolled in grades 8-12. Most of these students are bussed students, who spend anywhere from half an hour to two hours a day commuting from their villages to the school.

The majority of the students is comprised of Gitxsan and Wet'suwet'en teenagers. They make up over 85% of the student body (L. Wiebe, personal communication, April 3, 2008). The students live on reserves along the Skeena, Bulkley, and Kispiox rivers. They reside in the villages of Gitwangak, Gitanyow, Gitsegukla, Gitanmaax, Glen Vowell, Kispiox, Hagwilget and Moricetown. The first six reserves are Gitxsan and the last two are Wet'suwet'en. The remaining 15 percent of the student body are non-native and generally live in Old Hazelton, New Hazelton, South Hazelton, and the Kispiox Valley.

The native community members have expressed their concerns about the lack of achievement among their children and deplore the problem of many students graduating from school without the skill levels needed to complete college or university courses. Teachers have expressed concern and frustration with trying to engage students in their learning, while at the same time trying to address a prescribed curriculum, provide accurate assessment of student learning, and prepare students for provincial exams in Grades 10, 11, and 12. All the while, student attendance is poor. The school and the community want change.

Problem

Too often it seems that public education emphasizes quantitative measurement of learning that has already been achieved and neglects the role it needs to play in guiding learning. Learning theory research suggests that learning requires the student to be an active participant in the learning environment (Coker & White, 1993). If students are to become active participants in their learning then teaching practices must include opportunities for students to become interested in the learning process. Some of these practices include encouraging students to take risks, making mistakes and learning from them; helping

students to make connections between new ideas and what they already know; and allowing students to take responsibility for their learning (Coker & White, 1993).

Case (1999) argued that learning occurred when teaching presents students with opportunities to engage with the information through experiences that have meaning and importance to the students. Too often tests, lectures, and workbook assignments present students with, and require recall of, factual information leaving little opportunity for students to become involved in their learning. Barrett (2007) argued that assignments given for the purpose of summative assessment are more often assignments that have little meaning or importance to students beyond the acquisition of a numerical grade. As teachers struggle to meet the growing demands of accountability, students remain disengaged from their learning, completing assignments and tests for no other purpose but the acquisition of marks.

Throughout British Columbian schools, provincial exams are administered to Grades 10, 11 and 12 students. Foundation Skills Assessment (FSA) exams are administered to Grades 4 and 7 students. Parents, school districts, the provincial government, and the Fraser Institute want the quantitative data from these tests to be used as a measure to indicate that students are learning. The cost of getting this quantifiable data is that teachers present students with numerous assignments and tests that students feel are done *to* them, leaving students disengaged from their learning (Barrett, 2007). I believe that electronic portfolios could be a method of engaging students in their learning, supporting their reflection, and giving them possession of their own learning.

Rationale

Hargreaves (1999) suggested that most educational research fails to be of practical relevance for teachers and he suggested that educational research needs to occur in schools and be conducted by teachers. It is my argument that this study was of practical relevance to teachers and provided evidence that e-portfolios were useful tools for teachers.

Portfolios, both paper-based and electronic, have been used for a variety of purposes; from artists and models showcasing their work to investors tracking their financial records (Fiedler & Baumbach, 2005). More recently, portfolios have begun to be used in colleges and university education programs to document student competence in standards (Fiedler & Baumbach, 2005; Kitchenham, 2009). For example, from 2006 to 2009, Education students at UNBC were required to create electronic portfolios that documented student competence related to the British Columbia College of Teachers standards (Kitchenham, 2009). Portfolios are now used in medical education to track medical students' experiences with patients and procedures, and to provide those students with opportunities to reflect on those experiences (P. Newbery, personal communication, February 15, 2009). Much more research is being conducted related to the development of student teacher portfolios than on K-12 portfolios (Barrett, 2007). This thesis added to the literature on portfolio use in public schools.

Research question and supporting questions

This thesis was guided by the research question: To what extent are electronic portfolios effective classroom assessment tools for supporting deep student learning? Additional supporting questions included: What are the benefits of using electronic portfolios

in the classroom?; What are the disadvantages to using electronic portfolios in the classroom?; and Do the benefits outweigh the disadvantages?.

Limitations

This study considered two types of limitations, technical and pedagogical (Fiedler & Pick, 2004). Technical limitations included technical support provided by computer technicians, reliability of the computers themselves, and access to the necessary computers and computer programs. Pedagogical limitations included user skills of both the teacher and the students, student access to technology, and the curriculum learning outcomes.

In terms of specific technical limitations, the researcher relied heavily on the school computers to build the portfolios with students. These were rebuilt computers that were stored in a computer lab and were serviced by technicians in Terrace. Any number of these computers broke down and were not serviced for several days, sometimes weeks. In addition, the computer lab was shared by several classes and needed to be booked well ahead of time. On occasion I could not book the lab and students had to go to the library and other rooms throughout the school to access computers.

Pedagogical limitations that affected this study were: student absenteeism, varying levels of academic skills, varying levels of understanding of computer technology, and support from home. Barrett (2007) identified one other pedagogical limitation relevant to this study; that is, the limitation of being the only teacher developing portfolios in a school. Barrett argued that the single teacher faces many unique problems, including, no community of support for that teacher. The teacher often has no one to whom to talk and no one with whom to share ideas.

The final limitation identified by Fiedler and Pick (2005) are the curriculum learning outcomes. The learning outcomes of the Comparative Civilizations 11/12 course were specified by the Ministry of Education (2006) in the Integrated Resource Package. The content of the portfolios was partially defined by the Ministry's learning outcomes.

Delimitations

Some of the delimitations of this study were the number of classes with which I developed portfolios, the method of portfolio presentation, and the organization of the portfolio. Portfolios were used for qualitative assessment in only one Comparative Civilizations 11/12 class. There were reasons for choosing this course; most importantly, the Comparative Civilizations curriculum was one with which I was familiar and could foresee working well with portfolios. Additionally, the class was small which would allow for sampling one group through convenience sampling.

All portfolios were presented in an electronic format for a variety of reasons. First, the paper-based portfolios that the researcher had personally created ended up being large, cumbersome binders that could be effectively shared with only one person at a time. The paper-based portfolios that I had collected from my students were large and unwieldy; they were often full of loose papers that could be easily lost or moved out of place and when the class consists of 25 students, transportation of the portfolios became unrealistic. The data stored in electronic portfolios were easy to edit, easy to transfer to discs, thumb drives, email or webpages and were easy to present as slide shows or webpages. To avoid having these portfolios become nothing more than digital scrapbooks, the portfolios were organized around four key elements identified by Barrett (2007): (a) a set of learning goals, (b) the

learners' reflections on their achievement of the goals, (c) the learners' rationales for selecting the artifacts, and (d) an overall reflection on the portfolio itself.

Definitions

This section will review terms that were used throughout the study. Terms that required definition are:

Artifact: This is evidence chosen to demonstrate completion of a required task (Barrett, 2005).

Assessment: Montgomery and Wiley (2004) defined assessment as the collecting of data about a student, comparing the data to standards previously set and making a judgment based on those data.

Assessment for student learning: This is ongoing classroom assessment that provides information about student achievement in order to advance their learning (Stiggins, 2002).

Assessment of student learning: This is assessment that provides evidence of achievement for public recording (Stiggins, 2002).

Electronic portfolios: These are defined by Barrett (2007) as portfolios that use electronic technologies as the containers allowing students to collect and organize artifacts around a set of learning goals. They allow for learner reflection on their achievement and rationale for selecting the artifacts.

Portfolios: Barrett (2005) defined portfolios as a selection of work chosen by the learner, reflected upon, and presented to show growth and learning over time.

Reflection: Cambridge, (2001) defined reflection as the process of thinking about how we learn. This process requires stepping back from the learning experience and analyzing it, explaining the process of creating it, assessing its strengths and creating strategies for improving it. Reflection supports durable learning and personal growth (Falls, 2001). Montgomery and Wiley (2004) suggested that reflection is the most important element of portfolios.

Summary

Teaching staff and community members are concerned about the lack of achievement among the students at my school. Teaching staff struggle with engaging students in their learning and in meeting the requirements of assessment. This thesis studied how electronic portfolios were used in a Comparative Civilizations 11/12 class to support student engagement and learning and the teacher's need for assessment. I believe that the research will be of practical use to the staff at Hazelton Secondary and teachers elsewhere.

CHAPTER TWO: LITERATURE REVIEW

Chapter 1 outlined the importance of the study, articulated the research question, and defined key terminologies. Chapter 2 will provide an analysis and synthesis of the professional literature. The review begins with a discussion of what a portfolio is and the purposes of the different types of portfolios. Next, the review presents recent studies that have utilized portfolios for assessment purposes. Then, specific studies that look at the technical quality, fairness, effects, and feasibility of using portfolios in the classroom are examined. The review will conclude by examining electronic portfolios, discussing what they are, how they are different from paper portfolios and what are the advantages and disadvantages of electronic portfolios.

Portfolios

Since the 1990s, use of electronic educational portfolios in schools has grown significantly. Two reasons for this growth can be attributed to the rise of the constructivist approach to education which emphasizes learning by experience and a rise in the wide spread use of computer technology in education (Meeuse, Quiestier & Derks, 2006). This section begins by defining what an educational portfolio is. It then presents studies that highlight a system of portfolios used in my study to support student reflection, learning by experience, and my need for assessment.

Meeuse, et al. (2006) defined a portfolio as a collection or inventory of a number of pieces of work for presentation and as a method for demonstrating (showcasing) a person's best work. Artists, writers, architects, and models have kept portfolios for decades with the intent of demonstrating their best work and seeking further employment (Barrett, 2007).

Portfolios used by students to support their learning need to do much more than showcase students' best works. Portfolios used by students need to exhibit the students' efforts, progress through a course, and specific achievements (Rogers & Chow, 2000). Barrett (2007) went further in defining portfolios and stated that portfolios used by students needed to first support students' reflections on their work and demonstrate their learning and growth over time, showing what they know and are able to do. These are portfolios that contain students' works, both good and bad, and more importantly, contain students' reflections on the learning process that occurred in creating these works. These portfolios are often referred to in the literature as educational portfolios. My study focused on the use of educational portfolios.

Portfolios in K-12 Education

Barrett (2007) stated that educational portfolios have taken on three basic purposes: to support learning; to support assessment, both formative and summative; and to support employment and marketing. Barrett and Carney (2005) argued that these purposes are often in conflict with one another and that when institutions use one portfolio to try to cover all three purposes, none of the purposes end up being covered well.

Barrett (2005) suggested a portfolio system that consists of three interwoven systems. It begins with learning experiences defined by the curriculum in which the students create work that is stored in a working portfolio. From the working portfolio, these artifacts can be used as either evidence for summative or for formative assessment. For summative assessment, artifacts are selected from the working portfolio, evaluated by the assessor based on rubrics and the results are stored in the institution's management system. For formative

assessment, the learners select artifacts and reflect on their learning experiences born from creating these artifacts to build a presentation portfolio.

Portfolios in Post-Secondary Education

Tosh, Light, Flemming, and Heywood (2005) completed a study that supported the idea that one portfolio could not effectively cover all three purposes. Tosh et al. highlighted the first and second year of their research on the use of electronic portfolios at the University of British Columbia (UBC) and the University of Waterloo (UW). UBC's electronic portfolio project was campus wide and examined the pedagogical benefits and resource implications of using electronic portfolios for several purposes such as supporting student reflection and the university's need for assessment. UW's portfolio project examined how portfolios could be used to help students connect their learning experiences and to show competency in a given domain.

Tosh et al.'s study used mixed methods to gather the data from UBC and UW. Online questionnaires provided the quantitative data and interviews and focus groups provided the qualitative data. The data came from two courses at UW: History (n=37) and Accounting (n=361) and four courses at UBC: Education (n=20), Pharmacy (n=52), Biology (n=24), and Agricultural Sciences (n=56).

A major topic that emerged from the analysis of the qualitative data was assessment. All portfolios were assessed on quality of work, student reflections, and documentation that provided evidence of student learning. During interviews and focus group sessions, students expressed the feeling that assessing the portfolio made the portfolios nothing more than "just another assignment" (Tosh et al., 2005, p. 13). One student stated that "...portfolios are kind

of like assignments...for assignments you give them what they want and they give you your mark..." (p. 13). Students also resented having their reflections assessed. Students felt that if their reflections were personal, they should not be graded and that if the reflections were to be graded then students should be given a checklist to follow so that students could give the evaluators what they wanted to hear. Interestingly though, when students were asked if they would have used the portfolios without being assessed, most students said that they would not.

Tosh et al.'s (2005) study highlighted an interesting paradox for institutions using portfolios. That is, the assessment of the portfolios caused them to be viewed by the students as nothing more than assignments, effectively squelching self-reflection and student ownership of learning. However, assessment was necessary for encouraging students to use the portfolios. This cautionary note to ensure that the portfolios are more than simply completing an assignment was heeded in the design of my study.

Barrett (2007), Carney (2004), and Tosh et al. (2005) suggested that one portfolio may not be able to effectively cover the purpose of assessment and self-reflection. In particular, both Barrett and Carney argued that rather than focus on using one portfolio to cover multiple purposes, a system of portfolios should be used. This system would include a working portfolio, a method of assessing work (an assessment portfolio), and a show case portfolio.

A working portfolio contains all of a students' work, completed and uncompleted, that has accumulated throughout a course (Barrett, 2007). Both Barrett and Montgomery and Wiley (2004) referred to the working portfolio as a digital archive as it is not a true

portfolio because it does not contain self-assessment or personal reflection. The value of the working portfolio is that it is an easily-accessible source of work from which a student can choose the contents for any other type of portfolio that has a set purpose (Montgomery & Wiley, 2004).

Assessment portfolios contain student work that is drawn from the working portfolio and evaluated by the teacher to generate marks and assessment of student learning (Barrett, 2007). Like the working portfolio, these portfolios do not support student reflection and are often referred to as assessment management systems (Barrett & Carney, 2005; Barrett & Wilkerson, 2004).

Student portfolios or show case portfolios contain student work that is drawn from the working portfolio by the students. This work is reflected upon, self-evaluated, and presented to an audience with the intent of supporting deep learning (Barrett, 2007). Barrett (2007) argued that using a system of portfolios to support deep learning and to meet the institution's need for assessment is more effective than trying to use one portfolio. Institutions such as the Education Department at the University of Malta have recently begun to use a system of working portfolios and show case portfolios to support both student learning and the need for assessment (Chetcuti, Murphy, & Grima, 2006). I used a similar system of portfolios to support deep learning and my need for assessment.

Assessment

Using portfolios for summative and formative assessment purposes has gained in popularity in educational institutions (Driessen, van der Vleuten, Schuwirth, van Tartwijk, & Vermunt, 2005). This section will define formative and summative assessment and look

specifically at research by Barrett (2006) and Chetcuti, Murphy and Grima (2006) who examined the use of portfolios for assessment.

Stiggins (2002) defined formative assessment as a process of seeking and understanding evidence to advance students in their learning. This assessment supports the deep, durable learning that is so necessary in the classroom, and requires a portfolio that allows students to tell their learning stories. This assessment requires students to be involved in the process of selecting, reflecting on, and reviewing artifacts with the teacher that show their learning. Unfortunately, formative assessment does not necessarily support the summative assessment that teachers are under pressure to provide on midterm and final reports. In fact, Barrett and Wilkerson (2004) suggested that often summative and formative assessments are, by their very nature, in conflict with each other.

Summative assessment is assessment of what the student has learned to date (Barrett, 2007). Often it is quantitative, structured around a prescribed set of outcomes, requires extrinsic motivation, and is usually assigned at the end of a lesson, term, or semester. Hicks, Russo, Aturey, Garnder, Kabodian, and Edington (2007) argued that external assessment tasks are completed only as a means to that end and that they do not encourage student engagement or reflection. Often the assignments that support summative assessment are ones that students feel are done *to* them and do not support deep learning or student engagement (Barrett, 2007).

Initially, portfolios were used to support formative assessment and it was not until recently that portfolios have begun to be used for supporting summative assessment (Chetcuti et al, 2006). This approach has become the case with portfolio assessment in teacher

education in the United States (Zeichner & Wray, 2001). Chetcuti et al. (2006) and Barrett (2006) stated that while portfolios are now being used for both forms of assessment, students and teachers often experience a conflict between summative and formative assessment in portfolios.

McMullan et al. (2003) and Barrett (2006) noted that while summative assessment undermines the sense of student ownership of portfolios, and does not support personal reflection of learning, it is necessary for reporting purposes and its absence lessens the value students place on the portfolios. Although the two forms of assessment are in conflict with each other, they are both necessary. Several researchers (Barrett, 2005; Chetcuti et al, 2006; Tosh et al., 2005) have studied creating portfolio systems that support both the institution's need for summative assessment and the teacher's and student's needs for formative assessment.

Chetcuti et al. (2006) completed a case study that examined the formative and summative uses of portfolios. The case study was presented as a reflective dialogue. In this study, the authors suggested that portfolios could be used to support both summative and formative assessment. Formative assessment would be supported as students were building their portfolios and reflecting on their learning. Summative assessment would occur once the portfolios were completed and students showcased their work.

In 1999, the Ministry of Education in Malta introduced a change to the Education Curriculum. The change was from an assessment system dominated by summative exams to one which valued formative assessment for certification of teachers. This change caused the Education Department at the University of Malta to review their assessment practices

(Chetcuti et al., 2006). Faculty in the Department of Education agreed to introduce portfolios to shift the emphasis from assessment dominated by exams for certification to assessment that was formative (Chetcuti et al., 2006). The portfolio was to be predominantly a summative document used for certification. The process of building the portfolio would support formative assessment.

The faculty identified seven areas as necessary for the professional development of a teacher candidate: professional knowledge; teaching and learning process; management skills; information and communication technology monitoring pupil learning; professional qualities; community involvement; and professional development. Each of these became a section of the Professional Development Portfolio (PDP) and students included artifacts and reflections on strengths and areas of improvement to show competence in each area. Fifteen reflective writing tasks were assigned over the seven areas. Students received guidance about how to write reflectively. A similar process of identifying learning outcomes and having students include artifacts and reflections to show attainment of those outcomes was used in my study.

Chetcuti et al. (2006) reported that initially it was not mandatory that students and faculty use the portfolios but it was expected that they would. They stated that when the portfolios were first implemented 5 out of 200 students chose to make the portfolios. Faculty as well were reluctant to use the portfolios expressing concerns around the perceived workload , the difficulties of managing the portfolios and the limited degree with which the portfolios supported formative assessment because of the emphasis on showcasing best pieces of work. The decision was made to separate the two purposes of the portfolio:

formative assessment and summative assessment. A working portfolio became the focus for the faculty. The presentation portfolio was left up to the student to complete.

In 2003, the portfolio became compulsory. The formative function of the portfolio was addressed through the selection of artifacts, reflective writing activities, and dialogue between the students and faculty. In the final year, the portfolios were assessed summatively and students received a pass or a fail for the final grade. This method of focusing on the working portfolio and leaving the presentation portfolio up to the student was a method that I followed in my study.

Both Barrett (2006) and Chetcuti et al. (2006) argued that an institution's need for formative and summative assessment needed to be met, yet the two are often at odds with each other. Formative assessment allows the students to tell their stories by providing opportunity for student reflection and dialogue with the instructors. Stiggins (2002) called this phenomenon, deep learning. However, it does not necessarily provide extrinsic incentive for students to work on their portfolios. Summative assessment provides extrinsic incentive to complete the portfolios but it discourages risk taking, reflection, and the sense of ownership of work (Barrett, 2005).

To meet the need to support deep learning through formative assessment and extrinsic motivation through summative assessment, both Barrett (2006) and Chetcuti et al. (2006) suggested a portfolio process that has students building working portfolios and showcase portfolios Formative assessment would occur during the construction of the working portfolio. This process would be on-going throughout the course and be the natural time for students to reflect on and review artifacts with their teachers. Summative

assessment would occur at the end of the course and be based on showcase portfolios students had built out of their working portfolios.

This process of building working portfolios and showcase portfolios was used in this study. However, I used the working portfolio to provide both formative and summative assessment. The showcase portfolio was completed by students as a summary of their best work at the end of the course and was therefore assessed summatively.

Considerations for Effective Portfolios

Herman and Winters (1994) suggested four categories to consider when assessing portfolio effectiveness: technical quality, fairness, effects, and feasibility. Carney (2004) used these same categories in her literature review of specific studies of portfolios. Due to the rigour of their analyses, I used these categories in my literature review to examine whether portfolios are effective tools for supporting deep learning and for providing fair assessment.

Technical Quality

Technical quality refers to the portfolio's capacity for promoting and demonstrating deep learning (Carney, 2004). This section reviews work by Abraamidou and Zembal-Saul (2002) and Stansberry and Kymes (2007) which examined the technical quality of electronic portfolios.

Avraamidou and Zembal-Saul's (2002) research added to our understanding of how portfolios can be used to support deep learning. The authors examined the use of web-based portfolios to promote and support reflective thinking of two prospective

elementary teachers. Their findings help to confirm that electronic portfolios can prompt reflective, deep learning and highlights some conditions that support this deep learning.

In Avraamidou and Zembal-Saul's study, the electronic-portfolios were designed to support the student teachers' building evidence-based arguments about teaching and learning the subject, science. Two student teachers generated a series of claims about teaching and learning, supported these claims with evidence, and justified their evidence. These claims were modified or rejected on the basis of new evidence.

Avraamidou and Zembal-Saul (2002) collected two types of data: electronic portfolios centred upon three web-based science teaching philosophies developed by the participants, and reflective statements developed by the participants stating how they saw their teaching philosophies changing over time. Avraamidou and Zembal-Saul used three analytical techniques to examine their data: (a) pattern matching, (b) explanation-building and (c) time-series analysis.

The data analysis showed evidence of reflective learning in three areas. First, they demonstrated making connections between university coursework and field experiences. Second, transformations from participants' statements shifted from being descriptive to being explanatory and reflective. Finally, the two prospective teachers engaged in reflective and metacognitive activities such as making reflective statements about how their teaching philosophies changed over time. These three areas of reflective learning proved useful in the data analysis stage of my thesis.

Avraamidou and Zembal-Saul also recognized that three significant trends had developed in the portfolio work of the prospective teachers. They became more sensitive

to children's thinking, connecting physical engagement of children with conceptual aspects of learning, and becoming attentive to what teachers can do to support children's learning. Avraamidou and Zembal-Saul also found an interesting connection between the role of technology and reflection in building the portfolio. Web-based technology allowed prospective teachers to keep multiple versions of their philosophies and to see changes over time. The technology also allowed them to use hyperlinks to create non-linear links between their ideas and occurring themes. Finally, the internet allowed students to make their work visible to large audiences which Avraamidou and Zembal-Saul suggested motivated the authors to put their best work forward. The connection between the role of technology and reflection in building electronic portfolios was also apparent in my study and will be discussed in Chapter Four.

My study suggested that electronic portfolios can support deep learning through requiring students to make claims, justify those claims through the gathering and presenting of evidence in their portfolios, and make changes to their claims in light of new evidence. It also suggested that portfolios support deep learning by allowing students to track changes in their learning, make non-linear connections between knowledge and learning, and finally to put their best work on display for a large audience. Research by Abrami, Wade, Pillay, Aslan, Bures and Bentley (2008) and Stansberry and Kymes (2007) supported these findings and added to them by shedding light on how likely students are to continue using portfolios on their own and on how important it is for teachers to teach students the skills necessary for effective use of the portfolios. These findings were also supported by my research.

Stansberry and Kymes (2007) completed a study at Oklahoma State University that explored two questions. "Do teachers who have completed a Teaching With Technology e-portfolio evidence transformational learning?" and "Are teachers more likely to create and have students create web- based portfolios once they have created their Teaching With Technology e-portfolio?" Stansberry and Kymes defined transformational learning as learning that focuses on the individual as a reflective learner which occurs when an individual experiences an event, reflects upon that event, and experiences a shift in perspective. This study also suggested that portfolios can support deep learning.

The study targeted 78 teachers enrolled in Oklahoma State University's Learning and Leadership Master's degree program over four semesters. Each student completed nine instructional modules whose main goal was to make students proficient in using the World Wide Web and a variety of computer application tools (Stansberry & Kymes, 2007). The culminating project was a Teaching with Technology e-portfolio. The portfolios created contained artefacts that presented what the students had learned about the various technologies they had been introduced to and how they saw themselves using these technologies in the classroom. Students then shared their artefacts with others and reflected on the learning process they went through as they learned how to use the various technologies and adapt them to the classroom.

Sixty of the 78 students answered a pre-and post-survey consisting of 20 questions in a Likert-type scale that were designed to determine the students' likeliness to use technology tools as teachers; as well, all students wrote a final reflection paper that

that focused on the process of creating the Teaching with Technology e-portfolios. The pre- and post-surveys were analyzed using SPSS, a quantitative statistical software package. T-tests of difference were performed to measure the difference between the means of pre-survey and post-survey scores. The reflection pages were analyzed using Nvivo, a qualitative software package.

The quantitative data answered the question related to whether teachers were more likely to create and to have their students create web-based portfolios once the teachers had created their own Teaching With Technology e-portfolios. This question was of interest in my study because I asked a similar question in my questionnaire. Stansberry and Kymes found that the likeliness that teachers would maintain portfolios for themselves and their students had increased slightly. When asked "how likely are you to maintain a professional portfolio?" the mean response on the pre-survey was 3.65 (a score of 3 being unlikely and 4 being somewhat likely) and the mean response on the post-survey was 3.87. The observed t-score was -1.48. When asked "how likely are you to maintain a professional portfolio?" the mean response on the pre-survey was 3.65 and the mean response on the post-survey was 3.87. The observed t-score was -4.03.

The qualitative data answered whether teachers who had completed Teaching with Technology e-portfolios evidenced transformational learning. This question was of interest to my study because it was very similar to the first part of my research question, do electronic portfolios support deep learning? The qualitative data demonstrated that the students did evidence transformational learning.

Relying on Mezirow's work, Stansberry and Kymes identified transformational learning as consisting of several stages which they used as themes to code their qualitative data. The first stage is a disorienting experience that causes learners to become aware of the assumptions they hold about their learning world. The second stage occurs when learners begin to examine their assumptions and to explore new ways of acting. Learners move to a third stage when the build confidence in their new ways of acting and begin to look for ways to implement their new learning and in the fourth stage learners appear to want to share their new skills with others. Stansberry and Kymes found that most students experienced disorientation. Students reported that they often felt inept and out of their comfort zones. Having experienced disorienting dilemmas, students began to change their perspectives, to explore new ways of acting, and to appreciate the benefits of using technology to support teaching in the classroom. They then began to explore new ways of teaching and to change the way they acted as teachers. Students demonstrated pride in their electronic portfolios and in the technical skills they had developed. They wanted to share their portfolios and technical skills with their colleagues.

The qualitative data answered the second question and showed that students did experience transformative learning. Stansberry and Kymes noted that providing opportunities for reflecting on one's work and experience and for sharing those reflections with colleagues supported transformative learning. This agrees with the findings of Abrami et al.(2008), Avraamidou and Zembal-Saul (2002), Barrett (2007), and Tosh et al. (2005), who all found electronic portfolios support deep learning when opportunities for reflection and sharing reflections are provided.

Work by Avraamidou and Zembal –Saul (2002) and Stansberry and Kymes (2007) that examined the technical quality of electronic portfolios was reviewed. Avraamidou and Zembal-Saul's work confirms that electronic portfolios support deep learning when they support students building evidence based arguments and allow the students to track changes in their arguments. Stansberry and Kymes' work confirmed that electronic portfolios support deep learning by allowing students to progress through several learning stages, from a disorienting stage to a stage of exploring new ways of thinking to a final stage of sharing new learning. These learning stages were stages that I witnessed students progressing through in my study and will be further discussed in Chapter Four.

Fairness

If portfolios are to be used for assessment, particularly high stakes, summative assessment, for the purpose of certification or graduation, then institutions using portfolios must ensure they are fair (Wilkerson & Lang, 2003). Wilkerson and Lang (2003) argued that portfolios used for high stakes assessment are technically testing devices and need to be reliable and valid and free of bias . It is the work of Wilkerson and Lang that adds to our understanding of fairness as the second category of portfolio research.

Much of Wilkerson and Lang's article focused on portfolios being used for high stakes assessment: assessment for the purpose of graduation or certification; and it raised important points to consider around the fair use of assessment of portfolios in the classroom. These points are: lack of bias, equitable treatment, and opportunity to learn.

Wilkerson and Lang (2003) stated that bias occurs several ways. First, bias can occur when the activity is relevant to classroom use of portfolios. For example, when there is a lack of clarity in instructions or the use of scoring rubrics that credit a certain type of response and when the portfolio authors write what they believe the teacher wants to see. Hall and Callery (2001) called this occurrence a power imbalance and suggested that it occurs when researchers are collecting qualitative data the researcher wanted to hear. In an attempt to avoid bias in this study I encouraged students to help construct the scoring rubric that was used to assess their work. Students appreciated this, and while not all students contributed to the rubric everyone understood it and could use it to assess their work. Effort was also made to connect one-on-one with students to ensure that the instructions were clear.

Equitable treatment refers to the way in which the test is administered (Wilkerson and Lang, 2003). In the case of portfolios it refers to the provision of opportunities for success (Wilkerson & Lang). There must be equitable use of resources, equitable support from the teacher, and equitable opportunity to work on the portfolios. To ensure students had equitable opportunity for success in this study, I provided students with ample opportunity to use the school computers; all students were allowed to take their thumbdrives home to work on their portfolios, and they used a generic tool, PowerPoint, with which all students were familiar and to which all students had access to build the portfolios. This access will be discussed further in this chapter and in Chapter 3.

Opportunity to learn requires that students have adequate opportunity to learn what they are tested on (Wilkerson & Lang, 2003). For portfolio use in the classroom

this form of fairness means that students have had the opportunity to learn how to write reflectively, how to self-assess, and have had the opportunity to create the necessary artefacts and to fix their mistakes (Wilkerson & Lang). In my study, I provided students with the opportunity to create their artefacts and to make changes to their work during class time. I worked with students one-on-one to teach them how to write reflectively and to self-assess which will be further discussed in the next chapter.

Wilkerson and Lang (2003) argued that if institutions are to use portfolios for assessment, they must ensure the process of building and evaluating the portfolios is a fair process. To ensure the process is fair, teachers must work to ensure lack of bias, equitable treatment of students, and opportunity to learn the skills on which the students are assessed.

Effects

Another consideration in the use of electronic portfolios is the effects on teachers and students of using electronic portfolios. Brown (2002) noted some common effects of portfolio use were a greater recognition and understanding of learning, an increase in self-knowledge, increased confidence in the use of technology, and a change in how student work was assessed. These effects were present in my study findings and will be further explored in Chapter 4 of the thesis.

Brown (2002) used qualitative techniques to create a descriptive account of portfolio development from the perspectives of eight adult students enrolled in Barry University's School of Adult and Continuing Education in Miami. All students created an experiential learning portfolio as part of the undergraduate program. Six students

were purposively selected from a group of 20 students who had used the instructional materials for developing their portfolios. Two more students were selected to give equal representation of males and females. The attempt was also made to ensure representation of the major ethnic groups at the university (African American, Caribbean Black, Caucasian, and Hispanic).

The study used two sources of data, the portfolios and one-on-one interviews. Each participant was interviewed twice over a four-month period. Interviews were recorded and transcribed. A constant-comparative analysis and open coding of each interview was done. Themes were identified and three major findings were presented.

Brown found a marked increase in participants' self-knowledge after portfolio development; a recognition of the value of learning from work and mentors; and improved competencies, and an appreciation of the role of reflection in learning. An increase in self-knowledge was demonstrated two ways. First, students demonstrated increased recognition of all their accomplishments throughout their careers, and from this they developed a sense of empowerment and a capacity to achieve future goals. The value of learning from work and mentors meant that students recognized the value of other life experiences as sources of learning. Improved competencies referred to improved communication and organizational skills.

This study highlighted significant effects of electronic portfolios that were reflected in my study: increase in self-knowledge, value of learning through work and mentors, and increased communication and organizational skills. Of particular importance in self-knowledge is the possible effect of students feeling pride in their work.

As in Stansberry and Kymes' study (2007), Brown's participants felt a sense of pride in completing their portfolios and wanted to share their work with family and friends. The students in my study reported that they valued electronic portfolios. In recognizing the value of learning through mentors, Brown's participants recognized the role others played in their educations and in turn the role they could play in their classmates' educations. The students in my study reported that they appreciated being able to support one another's learning. Increased communication and organization skills are two final positive effects of using electronic portfolios. Brown notes that without exception students described a sense of improved writing skills and an increased confidence in their communication skills. The students in my study also expressed a sense of improved writing skills and increased confidence in their ability to present their ideas to others.

Brown's study highlighted significant effects of using electronic portfolios that are relevant to this thesis. These effects are, recognition of the value of learning from mentors, improved competencies and an appreciation of the role of reflection in learning.

Feasibility

There are several challenges that make portfolios difficult to implement and perhaps even ineffective in the classroom. Herman and Winters (1994) identified several challenges to successful portfolio implementation: the demands on teacher and student time as they learn to use new technology, development of tools for assessment of portfolios, and teaching the skills necessary for building portfolios, such as reflection on learning. Carney (2004) also identified challenges to implementing portfolios in the

classroom. She presented adequate access to technology and sufficient technical support as two factors that affect the feasibility of implementing portfolios.

Abrami, Wade, Pillay, Aslan, Bures, and Bently (2008), working at the Centre of Study of Learning and Performance (CSLP), completed a study at Concordia University in Montreal, Quebec that adds to our understanding of feasibility. Their main goal was to examine whether ePEARL support self-regulated learning and enhanced teaching strategies. CSLP developed web-based portfolio software, Electronic Portfolio Encouraging Active Reflective Learning Software (ePEARL), which was designed with the intent of supporting self-regulated learning. ePEARL was targeted for early elementary, late elementary, and secondary schools. The main features of ePEARL included: personalizing the portfolio, setting goals, reflecting on work, sharing work, receiving feedback from teachers, peers and parents, editing work and storing work in a presentation portfolio.

Sixty-two school teachers from elementary schools in Quebec and 1,200 students were involved in a one-year study of the use of ePEARL in their classrooms. The design of this research project was a one group, pre-test-post- test design. Questionnaire data were collected prior to use of ePEARL and at the end of school year. Abrami et al. (2008) used two questionnaires: one was entitled a *Teaching and Learning Strategies Questionnaire* (TLSQ) and the other was entitled *Student Learning Strategies Questionnaire* (SLSQ). The TLSQ was given to the teachers, and contained several open-ended questions and 73 close-ended Likert-scale questions. The SLSQ contained several open-ended questions and 19 Likert-scale questions. It was used to triangulate

data from the TLSQ. Abrami et al. also held teacher focus groups that discussed experiences with learning strategies, motivation, collaboration and feedback, work space and portfolio environments, support, and technical difficulties.

Teachers were asked to use ePEARL three hours a week for about 12 hours a month. Only five percent of the teachers used ePEARL for 9-12 hours a month, 80 percent used ePEARL less than asked and 10 percent used it for more than 13 hours a month.

Analysis of the student portfolios did not show widespread or extensive use of the ePEARL tool. Most of the portfolios were used to collect work and showed little evidence of self-regulated learning strategies such as self-reflection and teacher feedback. Of the teachers who used ePEARL extensively, their student portfolios demonstrated the use of self-regulated learning strategies, helping the students to improve their work and to become better learners.

Their analysis of the pre- and post-tests showed some positive effects of using electronic portfolios. Students began to use their portfolios to identify strategies for achieving their learning goals, to demonstrate their strengths, and to identify areas needing improvement. The focus groups provided qualitative data that provided information about the feasibility of electronic portfolios.

Further analysis of the focus group data revealed that teachers found several challenges in teaching students the processes involved in using electronic portfolios for self-regulated learning. Teachers found that students needed to be taught learning strategies and learning goals, and how to collaborate and provide feedback on one

another's work. Teachers also discussed the need for extensive support from their colleagues and administration. Despite the challenges teachers faced, the focus groups also revealed that teachers valued the processes involved in teaching self-regulated learning.

Using data from these student and teacher questionnaires, it is reasonable to conclude that using electronic portfolios was positively viewed and feasible for supporting self-regulated learning. However, analysis of the portfolios themselves did not reveal a high number of portfolios that showed significant levels of self-regulation. These results were similar to the results in my study and will be discussed in chapter 4. Abrami et al. (2008) suggested that often the portfolios were used only to store student work. Using qualitative data from the focus groups, the authors showed that teachers faced several challenges in using electronic portfolios to teach students self-regulation skills and relied on support from administration and teaching staff. One of the greatest challenges I found in my study was teaching students the skills of self-reflection and self-assessment. Finally, looking at the number of hours that ePEARL was used in a month, most teachers used the technology less than Abrami et al. had requested. Abrami et al. suggested that reliable access to technology may have been a contributing factor.

This study also found that using electronic portfolios was positively viewed by both the students and me and it was clear that the portfolios could support self-regulated learning. However, it required a concerted effort on the part of both me and the students to ensure that the portfolios were used to support self-regulation and were not simply tools for storing student work. In contrast to Abrami et al's study, I found that

technology was being used too much and that students began to look for other ways to create their artifacts for their portfolios. These findings will be further discussed in Chapter 4.

Abrami et al. (2008) study supported the findings of Avraamidou and Zembal-Saul (2002) and Stansberry and Kymes (2007) showing that electronic portfolios do support deep learning. Abrami et al.'s study went further, though, and suggested that teachers who implemented electronic portfolios in their classrooms for the purpose of supporting deep learning face several challenges. First, the teachers need to be prepared to make the time to teach the skills necessary for deep learning. Second, teachers need to have access to reliable technology. Third, teachers need the support of fellow teaching staff and administration. The work of Abrami et al. highlighted challenges that teachers face in using electronic portfolios to support deep learning.

Wetzel and Strudler (2006) completed a study that investigated the effects of electronic portfolios in pre-service teacher education by examining the experiences of students who used electronic portfolios throughout their teacher training programs. This study augments our understanding of the feasibility of portfolios. The goal of the study was to examine what the students saw as advantages and disadvantages to using electronic portfolios and to see if the students believed the advantages outweighed the disadvantages. This was an important study for my research as it addresses one of my research questions.

This study used case methodology to examine student perspectives during the construction of electronic portfolios. Twenty-six teacher education programs that used

electronic portfolios were selected initially for the study. An online questionnaire administered using Survey Monkey, followed by phone interviews were used to make a final selection of six universities.

Each of the six universities was visited. A non-random, purposeful sample of informants was made. Overall, 124 informants were interviewed using over 80 semi-structured interviews of individual and small groups. Of the 124 informants, 48 represented the student perspective. This 37% consisted of three groups of students, those who were at the beginning of their program, those who were mid-way through their program, and those who had recently graduated from their programs. All interviews were taped, transcribed, and analyzed using the *HyperRESEARCH Qualitative Analysis Tool Field*. Using the constant comparative method, data were analyzed as it was collected. Triangulation of data from interviews, reviews of portfolios, and field notes was made to confirm the trustworthiness of the interview data.

For this study, the researchers focused on what students believed the benefits and costs of using electronic portfolios were. Wetzel and Strudler (2006) reported that the students considered the benefits of electronic portfolios to be: opportunity to reflect, better access to and organization of documents, increased technology skills, and a tool that was useful for employment. Students in my study reported similar benefits to using electronic portfolios. Students considered the costs or disadvantages of using electronic portfolios to be: access to and reliability of the technology and time and effort spent on the portfolios. Students in my study reported reliability of the technology and access to the technology as a disadvantage as well. In answering the question as to whether the

students believed that the benefits of making electronic portfolios were worth the disadvantages, Wetzel and Strudler found that the students' responses depended on four aspects: clarity of purpose, clear procedures, value of reflection, and feedback from the faculty. These four were reflected in my own study.

There are benefits and disadvantages to building portfolios that affect feasibility. Benefits consist of improved technical skills, improved organizational skills and opportunities to reflect. Disadvantages consist of time required to build electronic portfolios and insufficient access to reliable technology. Creating electronic portfolios can be a feasible task if the purpose of the portfolios is clear to the students, the process is easy to follow, access to reliable technology is appropriate and assessment of the portfolios is thoughtful and worthy of the work students have put into the portfolio.

Electronic portfolios

The use of portfolios as tools to support assessment and student learning in education has been in practice for the past few decades. Originally, portfolios were paper based and, within the past 15 years creating portfolios electronically has grown in popularity (Cambridge, 2001). Creating portfolios electronically offers several advantages over creating paper based portfolios, but it also introduces several disadvantages unique to electronic media. This section will review studies that have examined the advantages and disadvantages of electronic portfolios and it will review different methods available for creating electronic portfolios.

Van Wesel and Prop (2008) argued that in the past few years, there was a noticeable shift in higher education from the use of paper-based portfolios to electronic portfolios, and

that the electronic portfolio became the preferred choice of portfolio in educational settings. The electronic portfolio is a multimedia portfolio that allows a student to present learning and reflection in a variety of media formats which may be slide shows, videos, text or graphics (Montgomery & Wiley, 2004). Driessen, Muitjens, van Tartwijk, and van der Vleuten (2007) pointed out that electronic portfolios contain the same content as traditional paper-based portfolios, but they present the information through multimedia technologies and are stored on disks, CDs, Zip disks or file servers on the World Wide Web such as blogs and wikis, which provide several advantages to the traditional portfolios (Avraamidou & Zembal-Saul, 2006; Heath, 2005; van Wesel & Prop, 2008).

Some of the advantages that electronic portfolios have over the traditional paper-based portfolios include organization, transportation, distribution and demonstration of technological skills. Paper-based portfolios require that artifacts be printed, organized and prepared for a binder. Heath (2005) pointed out that it is much easier to keep artifacts in an electronic format and to organize them electronically. Once the portfolio is created, it is easy to update, maintain, and edit documents and to transport and share the portfolio with others (Avraamidou & Zembal- Saul, 2006; Bartlett & Sherry, 2004).

Heath (2005) stated that electronic portfolios are much more portable and easier to duplicate and share with a large number of people than traditional paper-based portfolios. Another significant advantage of electronic portfolios over paper-based portfolios is that electronic portfolios can support the creation of complex relationships between artifacts through the use of hyperlinks whereas paper-based portfolios must remain linear (Avraamidou & Zembal-Saul, 2006; Heath, 2005;). For instance, another

advantage of using electronic portfolios over paper-based ones is that electronic portfolios improve student motivation and result in students spending more time working on electronic portfolios than on paper-based portfolios (Driessen et al. 2007). Barrett (2007) pointed out that if electronic portfolios are to be used to support deep student learning efforts must be made to ensure that the electronic medium can support self-reflection. In the present study, the students emailed their artifacts to me and stored their electronic portfolios on jumpdrives or compact discs. Additionally, the students were keener to work on their electronic portfolios and to spend more time developing them than if they had used the aforementioned binder system.

There are many advantages to using electronic portfolios over paper-based portfolios. Van Wesel and Prop (2008) conducted a large study of 347 first-year medical students. Forty-five percent of the students (n=157) created electronic portfolios while the remaining students (n=190) created paper-based portfolios. The aim of the study was to compare student perceptions about the support each portfolio provided for self-reflection. Seventy-one students were selected by random sampling to fill out a questionnaire that focused on their perception of the support their portfolios offered for self-reflection. Thirty-six of the students used electronic portfolios and 35 used paper-based portfolios.

Using a non-parametric test, a Mann-Whitney U-test, the researchers found no statistically-significant difference between student perceptions about the support for self-reflection offered by their portfolio type. Van Wesel and Prop suggested that this finding indicated indifference among students about the type of portfolio they used. They also

suggested that this result supported the use of electronic portfolios as there did not appear to be a negative effect connected to support self-reflection.

While there are many advantages to using electronic portfolios there are some disadvantages as well. Van Wesel and Prop (2008) identified technical problems associated with building portfolios on the internet. One common problem they ran into was that during times of heavy server use, students were redirected to unavailable servers and could not work on their portfolio until the server use had lightened. Another problem that van Wesel and Prop found was that some students created electronic portfolios that were confusing for their teachers to navigate so their teachers struggled to access, or could not access, all of the artifacts in the portfolios.

Other disadvantages to using electronic portfolios are access to computers, monitoring how students spend their time on the computers, and keeping the content of the portfolio as the priority (Heath, 2005; Meeus, Questier, & Derks 2006). One final disadvantage to using electronic portfolios is the opportunity for the portfolio's content to become lost in a flashy presentation. As mentioned early in the limitations in Chapter 1, many of the students in the present study only had access to computers at school. All of the students were bussed students so their access to school computers was limited to the school day. During the school week, access to computers was restricted to the number of classes that the computer lab was available. During our time on the computers, monitoring students to ensure that they are working on their portfolios was a steady job. Presently because of the system the school uses for tracking attendance and posting marks, the school could not block student access from sites like Facebook, MSN and other chat lines as well as gambling sites

where they could play poker. A request had been made to fix this problem but it was not addressed by the conclusion of the study.

Within the last decade, there has been a significant shift away from using paper-based portfolios to using electronic portfolios in educational settings (van Wesel & Prop, 2008). There are numerous advantages and disadvantages to this shift. Electronic portfolios are easier to maintain, edit, duplicate, transport and share with others (Heath, 2005). However, electronic portfolios also require adequate access to reliable computers and programs, and that teachers spend the time teaching their students how to use the computers and programs (Avraamidou & Zembal-Saul, 2006). One concern about the shift to using electronic portfolios over paper-based portfolios is the possibility that electronic portfolios may not support self-reflection to the same extent as paper-based portfolios.

Generic and Customized E-Portfolios

Electronic portfolios can be developed using several methods. One method uses the generic tools common on most personal computers which include word processors, multimedia authoring tools like slide shows and portable document formats (PDFs) (Gibson & Barrett, 2003). Another method uses customized systems approaches that include servers and programming (Gibson & Barrett, 2003). Adopting this approach often results in using web-based systems such as wikis and blogs to build portfolios (Montgomery & Wiley, 2004) or it requires that a commercial portfolio program such as *SuperSchool Electronics* (manufactured by SuperSchool Software) or *Electronic Portfolio* (manufactured by Scholastic Inc.) be purchased (Fiedler & Pick, 2008). One final method uses web editor

programs like FrontPage and Dreamweaver (A. Kitchenham, personal communications, July 20, 2009).

Gibson and Barrett (2003) identified advantages and disadvantages to using either generic or customized methods. Low start-up costs and freedom of design are two advantages to using generic tools for building portfolios (Gibson & Barrett, 2003). The low start-up costs are due to the fact that most computers already have the generic tools installed. Freedom of design exists because students have complete control over the look and style of their portfolios. Freedom of design is a significant advantage to using generic tools.

Two disadvantages to using generic tools for building portfolios are time required to build them and the resulting need for intrinsic motivation. Students who are unskilled with using generic tools may require a significant amount of time to learn how to use the tools (Gibson & Barrett, 2003). Barrett and Wilkerson (2004) pointed out that intrinsic motivation to develop and maintain portfolios is the goal towards which teachers want to move students but stated that students need to begin working on portfolios with clear direction and extrinsic motivation. Pre-designed systems may help to provide the direction and extrinsic motivation that students need.

Pre-designed systems such as *Electronic Portfolio and SuperSchool Electronic Portfolio* have several advantages over the use of generic tools. These programs are often placed on a school network or the Internet making them easy to access (Montgomery & Wiley, 2004). These systems are easy to use and to navigate. Another advantage to these systems is that they provide an internal message system that allows the instructor or students to add comments to the work presented (Fiedler & Kaner, 2007). One final advantage to

using a pre-designed system, if it is on the web, is that students can access their e-portfolios and enjoy being able to show them to family and friends. In the present study, I did not have the physical or financial access to commercial electronic portfolio programs.

Two significant disadvantages to using a pre-designed system are the lack of privacy and the cost of the program. Everyone who has access to the web or the school network will be able to view the portfolio. Montgomery and Wiley (2004) pointed out that this publicity could discourage students from making meaningful reflections about their learning. The cost of purchasing a commercial program could be prohibitive. Unless the program were to be used by several teachers, it may not be worth it to purchase the program. For the reasons described above, I chose to use existing software, Microsoft PowerPoint, as it reflected the advantages and addressed the disadvantages outlined throughout this section.

Fiedler and Kaner (2007) reported on a study Fiedler completed that examined the impact of using portfolios for accreditation on the learning experiences of the students who had to use them. This study highlighted many of the advantages and disadvantages to the different methods available for creating portfolios. Fiedler's original study was a multi-site case study that investigated the experiences of pre-service teachers required to use portfolio creation software to build program-required portfolios (Fiedler & Kaner, 2007). The teachers were from two separate institutions. One group, from Venderbilt College, used a web-enabled portfolio management system called *CommercialFolio* and the other group, from Mason State University, used an off-the-self HTML editing tool called Dreamweaver to build their portfolios.

Data were collected using group interviews, individual interviews, observation notes of students in the classroom and in the computer lab, think-aloud work sessions, and the portfolios themselves. Interviews were digitally recorded and the think-alouds were videotaped. Both were then transcribed using voice recognition software and transcription software. All the data were then compiled into a hermeneutic unit using data analysis software entitled *ATLAS.ti*. The data analysis followed Creswell's data analysis spiral and a theoretical framework entitled Cultural Historical Activity Theory.

Two significant themes that emerged in Fiedler's study were creativity and transition. At both institutions the study found students placed importance on creativity in completing their portfolios. Students in my study also placed importance on creativity. Fiedler reported that students wanted to make the portfolios expressions of their individuality. In most conversations, students also recognized that their institutions were in transition as they implemented the use of portfolios and that the move to using portfolios was due to external demands.

The study also revealed two levels of tension that existed for the students as they built their portfolios. One level of tension was created for the students who had to use the web-enabled portfolio management system, *CommercialFolio*. The students were required to have faculty-completed rubrics that evaluated their work displayed with the work. *CommericalFolio* would not allow the students to use a rubric. Fiedler reported that this tension demanded a significant amount of student energy and time. Students were left feeling that the construction of their portfolios was a waste of time. In contrast to this tension was a second level of tension that occurred with students using the HTML editing

tools. These students felt that the capability of the tools was well beyond their ability to use them. Fiedler reported that this tension pushed students to become more proficient in using the technology and to explore ways they could use the technology in the future.

Fiedler's study adds to our understanding of the advantages and disadvantages to the different methods available for creating electronic portfolios and to our understanding of considerations that need to be made when implementing portfolios for student use. Students want the freedom to be creative and to express their individuality in their portfolios and are more likely to take ownership of their portfolios when they can express their individualities (Fiedler & Kaner, 2007). Students are also more likely to take ownership of their portfolios when they experience a tension that pushes them to become more proficient in using the technology to create the portfolios (Fiedler & Kaner, 2007).

Summary

This chapter began by reviewing professional literature that examined the effectiveness of portfolios in supporting student learning and concluded with specifically looking at the types of electronic portfolios that can be used in educational settings. Herman and Winters (1994) suggested four categories to consider when examining portfolio effectiveness these were: technological quality, fairness, effects and feasibility. Technological quality refers to the portfolios ability to promote deep learning (Carney, 2004). Fairness refers to the portfolios ability to support trustworthy assessment and to have no bias towards specific groups of the population (Carney). Effects refer to the outcomes of using portfolios on teachers and students (Carney). Feasibility refers to the cost and benefits

of using portfolios. When teachers consider using electronic portfolios in the classroom they may choose to use either generic tools or customized systems to build the portfolios.

Studies by Avraamidou and Zembal-Saul (2002) and Stansberry and Kymes (2007) add to our understanding of how portfolios can support deep learning. Avraamidou and Zembal-Saul's study found evidence of reflective thinking in three areas: making connections between coursework and life experiences; creating change in participants' statements, shifting them from descriptive statements to explanatory statements and evidence of teachers engaging in metacognitve activities. Stansberry and Kymes identified several stages that learners progress through as they experience deep learning. These stages are as follows: disorienting experience; examination of assumptions and exploration of new ways of acting; looking for new ways to use new learning and a desire to share new learning with others. Stansberry and Kymes' qualitative data showed participants in this study experienced a progression through these stages as they developed their electronic portfolios.

Browns' (2002) work adds to our understanding of the effects of portfolios. Brown found an increase in self-knowledge, recognition of the value of learning from life experiences and mentors, improved communication and organization skills and an appreciation of the role of reflection in learning. Two effects that standout in this study are increased self-knowledge and increased communication and organization skills. With increased self-knowledge came a sense of pride over the completed portfolios and a desire to share the portfolios with others. Increased communication and organizational skills were felt directly in improved writing skills and increased confidence in communication.

Feasibility refers to the costs and disadvantages of using electronic portfolios. Abrami et al. (2008) and Wetzel and Strudler (2006) studies add to our understanding about the costs and benefits of using electronic portfolios. Abrami et al. found that teachers who implement portfolios face several challenges. First they need to teach students the skills necessary for deep learning. Second, they need to teach students how to use the technology. Third, they need access to reliable technology. Work by Wetzel and Strudler highlights benefits and challenges students face. The benefits are access to technology and improved technological skills. The costs are time wasted because of unreliable technology and effort spent on the portfolios.

To answer the question whether portfolios could be used as tools to meet the teacher's need for assessment, work by Barrett (2005) and a case study by Chetcuti et.al. (2006) were examined. Barrett (2005) and Chetcuti et.al (2006) both suggested that one portfolio alone cannot meet the teachers' needs for summative and formative assessment but that the process of creating the portfolio can support both forms of assessment.

Barrett (2005) recommended building a working portfolio. From this working portfolio artifacts can be taken and either summatively assessed or used by the student to create a presentation portfolio which is used to showcase a student's best work accompanied by reflective writing. Chetcuti et al. (2006), their faculty and the University of Malta found in their case study that it was more effective to focus on building a working portfolio with the students. This supported formative assessment. Students then used some of the artifacts in this working portfolio to build a show case portfolio at the end of their program. This show case portfolio was summatively assessed on a pass or fail system.

Electronic portfolios can be built using one of three methods. First, a teacher may choose to use the generic tools common on most personal computers. These tools include word processors, multimedia authoring tools like slide shows and portable document formats (PDFs). Second, a teacher may use customized systems. These systems include using web-based systems such as wikis and blogs to build portfolios or it requires that a commercial portfolio program be purchased. Third, a teacher may use web editor programs like FrontPage and Dreamweaver to build templates which are used by students to create their portfolios.

This literature review has demonstrated that there are clear benefits and challenges to e-portfolios. The next chapter, Chapter 3 – Research Methods, will outline the design of the study. The methods will be explained and defended. In particular, I will make the argument that the design of the study attempted to address the advantages and disadvantages of e-portfolio construction, analysis, and evaluation.

CHAPTER THREE: METHODOLOGY

Chapter 1 outlined the study and introduced the central research question. Chapter 2 surveyed the professional literature on electronic portfolios and made a solid argument for this study. Chapter 3 will explain the research methodology as it relates to the research question: To what extent are electronic portfolios effective classroom tools for supporting deep learning and assessment?; What are the benefits of using electronic portfolios?; What are the disadvantages to using electronic portfolios?; and Do the benefits outweigh the disadvantages?.

Chapter 3 begins with a discussion of the decision to use action research as the method of research. It then presents the steps taken to ensure that I conducted the research in an ethical manner. The chapter then includes a description of the instrumentation used to gather and analyze the data and ends with a presentation of how the portfolios were designed and used during the semester.

Action Research

There were several different research designs I could have used to answer my research question. Some of them, an experimental design or a survey design, were not practical because of limitations in my teaching assignment or in the data that they provided. Other designs, a narrative design or a mixed methods design, would have worked well for helping answer my research question and I did employ mixed methods in my research. However, because I wanted to gather information that would directly improve my teaching and student learning, action research was the most appropriate research design to use.

The experimental research design is a traditional method of research in which researchers examine possible cause and effect between an independent and dependent variable (Creswell, 2008). To use experimental design I would have needed two Comparative Civilizations 11/12 classes. One class would progress through the course in a traditional way – reading texts, answering questions, writing tests. The other class would progress through the course building electronic portfolios. Since I only had one Comparative Civilizations class that year, this method was not feasible. However it would be an interesting method of research and quite feasible in other courses that I often teach twice in a row, such as Social Studies 9.

Creswell (2008) defined survey research as research that employs the use of questionnaires and interviews administered to a specific population in attempt to describe a trend. I used surveys in my research. Two questionnaires were administered; the first was given partway (midterm) through the course and the second was given at the end of the course. The quantitative data provided by the questionnaires showed students had a very positive experience building electronic portfolios and helped to answer my research question. While the surveys described a positive trend in the use of electronic portfolios they could not be used to explain this trend nor could they be used to understand student experiences building electronic portfolios.

Bogden and Biklen (2007) purported that any time a researcher truly wants to understand how people think about their experiences, the researcher needs to hear them talk and observe them in their day-to-day worlds. To understand the students' experiences, it was necessary for me to have sustained contact with the students in their classroom, to observe

them working on their portfolios, and to hear them talk about their experiences and opinions of the portfolios (Bogden & Biklen, 2007). Qualitative research methods were most appropriate to do this.

Narrative research design uses qualitative research to collect and tell, in detail, the narrative of an individual's experiences (Creswell, 2008). I could have used narrative research to focus on one student's experience building and maintaining electronic portfolios, or I could have used narrative research to tell my story of working with students to build and maintain electronic portfolios. This microanalytic method would have allowed me to answer my research questions from one individual's perspective. However, I wanted my research to improve my practice of teaching and to contribute to improving the educational setting at my school. I wanted a research method that would give a more comprehensive understanding of using electronic portfolios in the classroom.

Mixed methods research design is a procedure for collecting, analyzing and blending both qualitative and quantitative research when one type of research is not enough to answer the research question (Creswell, 2008). This is a research method I could have used to develop a more comprehensive understanding of using electronic portfolios in my classroom and to answer my research question. Indeed, I did employ both qualitative and quantitative research. But I wanted to achieve more than study the use of electronic portfolios in the classroom. I wanted to improve my teaching, my student's learning and I wanted to contribute to the educational setting at my school.

Craig (2004) argued that action research is effective in the classroom as it is based on practical problems and is planned and carried out by the person most interested in and

affected by the findings. Action research design is similar to mixed methods research in that it can use both quantitative and qualitative methods for collecting data, as I have done. However, it differs from mixed methods research in that it addresses a specific practical issue, and is a systematic procedure done by teachers to gather information that helps to improve their educational setting, their teaching and their student learning (Creswell, 2008). I chose to use action research for my study because in doing so I could use the quantitative data collected by my questionnaires and the qualitative data gathered through interviews and my personal journal to answer my research question with the intent of improving my teaching practice and contributing to a positive learning environment at my school

Research Design

Teaching staff at the school in which I teach struggle to find ways of engaging students in their learning and in meeting the requirements of assessment. Any classroom tool or methodology which enhances student engagement and facilitates student assessment is worthy of consideration and research. Recent research (Barrett, 2007; Chetcuti, Murphy, & Grima, 2006; Meeuse, Quiestier & Derks, 2006; Tosh, Light, Flemming, & Heywood 2005) has shown that electronic portfolios can be effective classroom tools for enhancing student engagement and assessment. This thesis studied how electronic portfolios might be used in a Comparative Civilizations 11/12 class at the researcher's school to support student engagement and the researcher's need for assessment. Students built portfolio templates using Microsoft Office PowerPoint 2003 and 2007. All the assignments were saved on portable thumbdrives that were given to each student once the letter of consent was received. For several reasons the Microsoft Office PowerPoint program was used to build the

templates for presentation of students' work. First, I am familiar with this program and did not require extra time to learn it during the school semester. Second, Microsoft Office PowerPoint is a relatively straightforward program to use and did not require a lot of time for students to become confident in using it. Many already had this program on their home computers and were familiar with it. Third, the templates could remain stored on the thumbdrives, giving students complete control over who viewed their work. Fourth, Microsoft PowerPoint is a recognized medium for building electronic portfolios that has many of the same capabilities as web editor. Fifth, I had initially hoped to have students build portfolios using a template constructed on Microsoft FrontPage, a web editing program; unfortunately, the school computers did not have any web editor programs that could use this template. Thumbdrives were used because they were the simplest method of having students store and access their work. The thumbdrives were durable and portable and the students were familiar with using them. Their use allowed many students to take their portfolios home to continue to work on their projects. At the end of the study, students were allowed to keep their thumbdrives.

A simple concept map modeled after one created by Barrett (2005) outlines the portfolio process that was followed (see Figure 1). The process began by identifying the prescribed learning outcomes for the Comparative Civilizations 11/12 course outlined in the British Columbia Ministry of Education's Integrated Resource Package (IRP) (2006). The second step was the creation of work that met the prescribed learning outcomes. The text *Odyssey through the Ages* (1992), the internet, and school library resources were used by me and the students to research and compare civilizations from around the world. The students' work was created, then formatively and summatively assessed by both the teacher and the

students using rubrics, and then stored in a working portfolio. The third step was the creation of a working portfolio which was simply a container for storing all the students' work, both completed and uncompleted.

Initially, all students completed their work using Microsoft Word or Microsoft PowerPoint. The completed work was stored in a file entitled *Working portfolio.* Later on in the course, some of the students grew tired of using these programs and completed their work in other ways, such as in posters or on Wikis. A digital photograph was taken of any non-digital work and stored in the working portfolio and links to student-authored Wikis were also stored in their working portfolio. The fourth step was the creation of a showcase portfolio. The showcase portfolio began with a homepage. Each homepage had four links

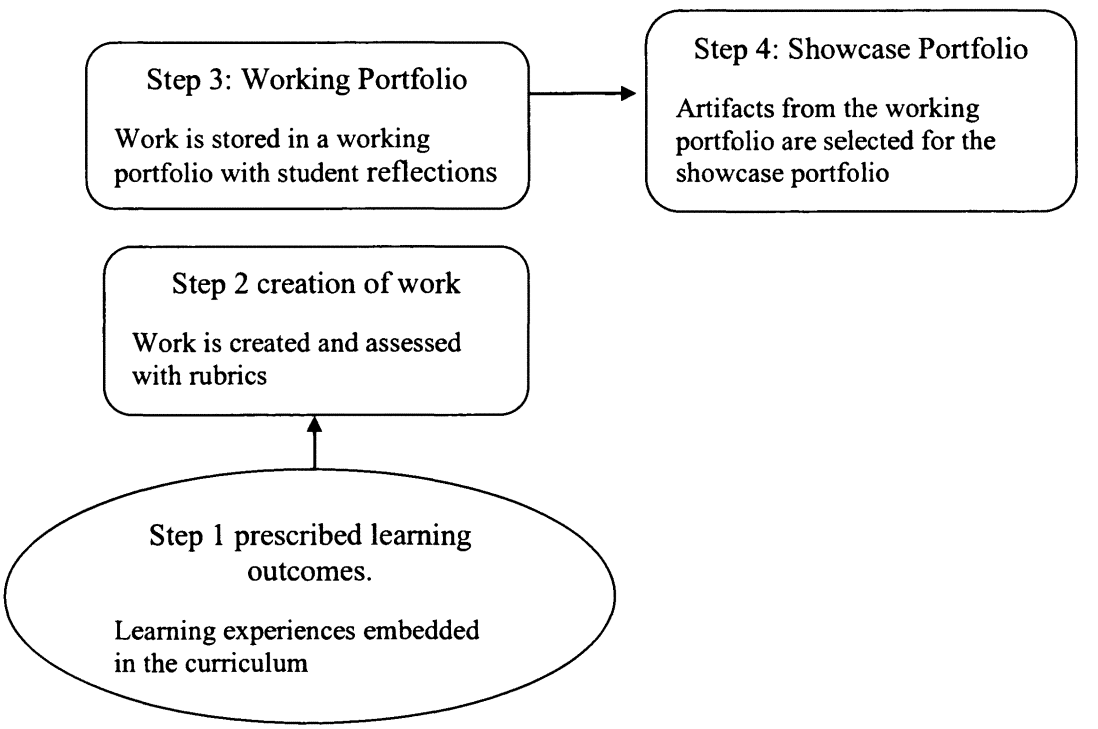

Figure 1. The basic steps in the portfolio process

representative of four prescribed learning outcomes of the course which students had selected on the basis of their feeling that they had done a good job of meeting these outcomes. Each link connected the reader to artifacts the students had created and selected as evidence of their meeting that prescribed learning outcome. The artifacts ranged in variety from digital photos of posters students had created, to essays students had written, to group PowerPoint presentations of cultures. Each artifact was accompanied by written student reflections about learning, and their self-evaluations. The reflections explained how the artifact met the learning outcomes and highlighted what the student had done well and what could have been improved. Self-evaluation was guided through the use of rubrics (found in Appendix A) and kept with the artifacts in the working portfolio. These showcase portfolios were examples of what the students believed to be their best work.

Ethics

The study was conducted at a secondary school in a Northwest BC school district. The data were collected between September, 2009, and February, 2010, and involved students from a Comparative Civilizations 11/12 class who had been assigned to me as part of my teaching assignment. There were several reasons for using Comparative Civilizations students at my own school. First, I had ready access to this group. Second, the teaching staff at this school is actively committed to finding ways of engaging students in their learning. By conducting the research at this particular school, the findings not only could be relevant and useful for the rest of the teaching staff, but also have a good possibility of being used. Third, I am familiar with the Comparative Civilizations curriculum and was able to build a portfolio template in one of my Master of Education courses to support that curriculum.

Before the study began, I obtained approval from the UNBC Research Ethics Board, the school district, and my own school principal. Once I received approval, I sent information letters and informed consent forms to all parents and guardians, and to the students who were part of the Comparative Civilizations class. The letter and consent form provided a brief description of the study, explained how the data would be used and assured complete confidentiality of student responses. In addition, the consent form required both the signature of the parent or guardian and the student participating in the study (see Appendix A). Only those students who received permission to participate were included in the study. The Comparative Civilizations class consisted of 15 students; 12 students returned consent forms. Two of these students were male and ten were female.

Bogdan and Bilken (2007) warned that teachers who conduct action research in their classrooms must be sensitive to the issue of coercion. The authority of the teacher may cause students to feel pressured to participate in the research. Hall and Callery (2001) suggested that the researcher has an obligation to create a sense of equity in the relationship with the participant. In an attempt to create a sense of equity between the students and me while maintaining my dual roles of teacher and researcher, I followed advice from Bogdan and Bilken as well as interview techniques used by Chetcuti (2007) in a study she completed that examined the use of portfolios as reflective learning tools in teacher education .

Bogdan and Bilken stressed that it is important to make the interviewee feel at ease. They suggested that this ease can be accomplished by assuring the participants of anonymity and confidentiality. In Checuti's (2007) study on reflection in portfolios, none of her questionnaires or surveys required the students to give their names. During the interviews,

Chetcuti assured the students of their anonymity and that pseudonyms would be used in the text. Following this model, none of the questionnaires or surveys used in this study required students to give their names and pseudonyms were used in the text.

Research Methods

This study used both qualitative and quantitative methods of gathering and analyzing data to address the basic research question. I decided to use mixed methods for two reasons. First, I wanted to have a variety of data to answer the research question and second, I wanted to use quantitative data to support the qualitative data. Having both quantitative and qualitative data allowed me to use triangulation to combine the data and use the results to answer the research question (Creswell, 2008).

Qualitative data had the highest priority and was supported by quantitative data because I wanted to explore and understand my own experiences as well as the students' experiences in building and maintaining electronic portfolios. When exploration of a complex situation is needed, such as the classroom experiences of a teacher and the students, qualitative research is used (Creswell, 2008).

Qualitative data were generated from four different sources: interviews of six participants, a journal kept by me, the completed portfolios, and answers given to open-ended questions in the questionnaire. Quantitative data were generated from a Likert-scale questionnaire and were used to complement the qualitative data. Triangulation of data was performed to ensure the validity and reliability of the data collected (Bogdan & Biklen, 2007). In the interest of creating a chronology of the data collection process, the data instruments will be discussed in the order that they appeared in the study.

Quantitative Methods

Quantitative data were collected first and I used the results to help develop the questions used in the interview. The quantitative data were generated from a questionnaire modeled after one designed by Abrami et al. (2008) in their research on using portfolios to encourage self-regulated learning (see Appendix B for my full survey). The questionnaire consisted of several open-ended and closed Likert-scale questions. There were 20 Likert-scale questions designed to assess the students' attitudes towards portfolios. Response to each item was scored on a scale of one to five (from strongly disagree to strongly agree). Some examples of the statements included: using an electronic portfolio has helped me to keep my work organized; using an electronic portfolio has helped me to be creative in completing my work; and using an electronic portfolio has helped me to demonstrate my strengths. This questionnaire was distributed twice. The first time I gave it to students part way through the course and the second time, at the end of the course. Survey Monkey was used to build, distribute and collect the surveys. This software allowed me to create a survey that was easy to use, and that ensured anonymity of the students. Other on-line survey programs like Zoomerang were available; however, I was most familiar and comfortable with using Survey Monkey.

I informed students that they would receive a link to the survey and that they were to complete the survey during class time. To maximize student comfort and the likelihood of honest answers, student anonymity was verbally assured and I left the room while students answered the questionnaire. Those students who were absent from class completed the

questionnaire the following day. All 12 students participating in the study completed the questionnaire.

The questionnaire was analyzed statistically using SPSS, a quantitative analysis software package available through UNBC. In particular, I calculated the median response to each question and performed non-directional t-tests of the difference between males and females.

The null hypothesis was that there was no difference between the experiences of the males and the females. The alternative hypothesis was that there was a difference between the males' experiences and the females'.

H_0: $\mu_1=\mu_2$

H_1: $\mu_1\neq\mu_2$

Although the sample size of male responses was too small to make any statistically significant claims about differences between male and female experiences using electronic portfolios, I have not come across any similar studies that included gender differences within their research. A much larger study might well indicate some gender differences. I believe this area is interesting for future exploration because, as a teacher, I have seen significant differences in learning styles of male and female students. For example, male students often appear to have greater difficulty organizing their work and are much less willing to do revisions. Female students often appear to spend more time than male students developing the presentation of their work. If there were differences suggested by my own study, it would be useful to point them out to my colleagues at school, as the electronic portfolio's

ability to support these differences could have bearing on the utility of electronic portfolios as learning tools for all students.

Qualitative Methods

Journal

Observational field notes were taken in the form of a journal, used to record my personal journey in developing and using electronic portfolios in my classroom (Suzuki Ahluwalia, Arora, & Mattis, 2007). I began the journal the week before classes began and ended the journal five months later, at the beginning of the second semester. The journal was a chronological record of two phenomena. First, it was a record of student behaviours, both physical and verbal, as they worked on developing their portfolios. I once wrote in my journal:

> Students appear excited about building the electronic portfolios. They arrive to class on time, remain on task throughout the class and email themselves their work at the end of the class…all students have a basic working knowledge of Microsoft PowerPoint. None have created hyperlinks before and are enjoying working with this feature, to the point where they are overusing it.

Second, it was a record of the mistakes, problems, successes, and ideas I encountered related to the implementation of electronic portfolios in my Comparative Civilizations class. I wrote:

> I am sure that blank discs are the best way to store the portfolios, but I do not know how to use them effectively. I have purchased the wrong ones, ones labeled CDR, when I should have purchased ones labeled CDRW. Additionally, some of the computers have disc drives that do not work. I know how to use thumbdrives, they are far more expensive than discs but right now I would rather pay for the thumbdrives than learn something new.

Interviews

The interviews were conducted for the purpose of obtaining a more in-depth understanding of the students' experiences using portfolios. For the interviews, I took a purposive sampling that was representative of the class based on participant characteristics (Creswell, 2007). Suzuki, et al. (2007) stated that these characteristics may be based on a representative number of males and females in the class, as well as, a representation of race, ethnicity, and age. Additionally, I deliberately selected one student who demonstrated a lot of success with the portfolio and one student who did not. The student who had a lot of success with the electronic portfolio was female. Three more females were selected in a semi-random manner for the interview. The names of all the females in the class were placed in a hat and three names were drawn for interviewing. The student who had the least success with portfolios was male and as there was only one other male in the study, he was also interviewed so that tests of significance results could be reinforced by the inclusion of both males. The interviews served to produce data that presented the interviewees' experiences from their points of view (Suzuki et al. 2007).

All interviews were recorded face to face, lasted between ten and twenty minutes, and were conducted over three days during class time. The questions asked ranged from close-ended simple question; such as, were you familiar with the PowerPoint program before the course began?, and would you use portfolios in other classes? Two more open-ended questions such as, describe what you liked/disliked about using electronic portfolios and describe your experience using electronic portfolios this semester. .

The data generated from the interviews were transcribed by me at a later time. The full transcription process required a taping, transcribing, coding and interpreting (TTCI) cycle (Lapadat & Lindsay, 1999). I chose to use the TTCI cycle for several reasons. First, it is a more complete, accurate, and unbiased examination of data (Lapadat & Lindsay, 1999). Second, this cycle preserves data in a more permanent, retrievable manner (Lapadat et al. 1999). This transcription cycle is one that Creswell (2008) presented in detail. Ziebland and McPherson (2006) also recommended a similar process of recording interviews, transcribing the interviews, reflecting on the data, coding the data, and analyzing the data.

Data Analysis

Once my data collection had begun so, too, had the data analysis. A journal was kept in which all ideas about possible codes and themes were recorded as they occurred to me. When the course ended, and the researcher's journal, the interviews, and the open-ended questionnaire questions were complete, these data were transcribed using Microsoft Word and then copied into NVivo 8, a qualitative data analysis computer software program. Data could have been transcribed directly into NVivo 8, and this was done at first. Unfortunately the Nvivo 8 file became corrupt and all the data were lost. The second time the Nvivo 8 file was created, all data were typed into Microsoft Word so that it would be there as a back-up should this NVivo 8 file also become corrupted

I chose to use Nvivo 8 for three reasons. It is the most frequently used and most-powerful software for qualitative data analysis. I am familiar with the program and it was readily accessible through the University of Northern British Columbia.

Analysis of the data was guided by two general questions: "What is the story told by these data?" and "Why did the story play itself out in this manner?" (Kitchenham, 2008). With these questions in mind, data were read and re-read and sections were collected under a variety of different headings such as, technology, motivation, management, creativity, buy-in, assessment, classroom management and so forth, as well as more abstract headings such as coping, deep learning, and isolation. Eventually a coding system was established and the data were reduced to meaningful segments. The segments were assigned codes and the codes were then analyzed and combined into broader themes (Creswell, 2007). The themes were used to produce conclusions that addressed the research question, to what extent do portfolios support deep learning and the teacher's need for assessment?

Creswell (2007) recommended developing no more than seven themes. Six themes that arose from analysis of the qualitative data were technology, organization, motivation, buy-in , assessment, and deep learning. The themes, buy-in, motivation, and technology also emerged in a study completed by Tosh, Light, Flemming and Heywood (2005). *Technology* referred to the students' abilities to use the electronic software to build their portfolios. When one student indicated that using Microsoft PowerPoint to build her portfolios was easy, this response was coded as technology. When another student stated that it was frustrating to have to use the web browser Fire Fox to access and edit her wiki because the web browser Internet Explorer would only allow her to view her wiki and not edit it, it was coded as technology. Organization referred to students being able to use their electronic working portfolios to keep their work organized. When one student said that he liked using the working portfolio to store his work because it was easier to find at a later date, this response was coded as organization. *Motivation* referred to the students being able to identify why

creating a portfolio was worthwhile. One participant wrote that he liked using portfolios because they helped him to stay organized. This response was coded as motivation. Another participant wrote that she liked being able to use portfolios because she could be creative. Her response was also coded as motivation. *Buy-in* referred to how the students viewed the portfolio and was influenced by the way in which the portfolio was promoted. Without proper promotion of the portfolio explaining the purpose for its creation, showing examples of good portfolios and including a demonstration of the benefits of portfolio creation, students would not view their portfolios as meaningful and would tend to regard them as no more significant than any other assignment. (Tosh et al. 2005). For example, one participant indicated that she initially felt that her portfolio was "just another assignment" that she expected to get marked on. This comment was coded as buy-in. Another participant indicated that she would have liked to have seen examples of completed showcase portfolios. This comment was also coded as buy-in. *Assessment* referred to both formative and summative assessment. When I wrote in my journal that I appreciated the ability to work individually with students looking back on past work and using that work to improve on future assignments, it was coded as assessment; when participants asked if they would be marked on creativity, it was also coded as assessment. *Deep learning* referred to learning that engaged students in reflection about their learning. One student wrote "...at first I felt my presentation on Greek mythology was well done, but when I received feedback from you (the teacher) and saw what other classmates had done, I realized how I could improve my presentation" . This response was coded as deep learning.

Chapter Summary

The use of electronic portfolios to support student learning and assessment at the post-secondary level has been studied extensively. My goal was to examine how I could use electronic portfolios to support deep student learning and assessment at the secondary level. This research used practical action research methods to address the question, to what extent are electronic portfolios effective classroom tools for supporting deep learning and assessment?; and additional questions: what are the benefits of using electronic portfolios?; what are the disadvantages to using electronic portfolios?; and do the benefits outweigh the disadvantages?

This action research was conducted in the Fall school semester of 2009 and involved 12 students from the researcher's Comparative Civilizations 11/12 class. Data collection and analysis consisted of attending to ethics, collecting qualitative and quantitative data. Quantitative data was generated from a Likert-scale questionnaire administered twice in the semester, once at midterm and once at the end of the semester. The median response to each question was calculated using SPSS. Qualitative data was generated from a personal journal, interviews of six students, the completed portfolios and open ended questions in the questionnaire. The qualitative data received the highest priority because the researcher wanted to explore and understand his experiences and the students' experiences with building and maintaining electronic portfolios.

Six themes arose from the data analysis: *technology, organization, motivation, buy-in, assessment,* and *deep learning*. Chapter 4 will describe the data under these six themes and Chapter 5 will provide my analysis and interpretation of the data.

CHAPTER FOUR: RESEARCH FINDINGS

Chapter 1 introduced the research problem and the research question, which examined the extent to which electronic portfolios were effective classroom tools for supporting deep learning and assessment. Chapter 2 surveyed the research on the use of electronic portfolios to support deep learning and assessment. Chapter 3 outlined the research methodology, discussed action research, and concluded with an overview of the research tools.

This chapter will outline the quantitative and qualitative data that were collected during the course of the research. First, I will provide a detailed description of the quantitative data that were generated from a Likert-scale questionnaire, administered once at the course midterm and again at the course end. These data were used to support the qualitative data. Then I will give a detailed description of the qualitative data which included prominent themes revealed during the course of the research. These themes were *technology, organization, motivation, buy-in, assessment,* and *deep learning.*

Quantitative Research Findings

I first reviewed the quantitative data generated from the questionnaire distributed to the students on two occasions, once part way through the course (midterm) and again at the end of the course. The results were then used to guide the development of the questions used in the interviews given at the end of the course.

First, I will present and discuss the data generated from the midterm questionnaire (see Tables 1-4) and then I will present the data generated from the questionnaire given at the end of the course (see Tables 5-8). I have grouped the questions under four of the six

themes that best answered my research question related to whether electronic portfolios supported deep learning and the two further questions that explored the benefits and disadvantages of using electronic portfolios. These four themes are *technology*, *organization*, *motivation*, and *deep learning*. The sample included 12 students from a Comparative Civilizations 11/12 class, consisting of two boys and 10 girls. Seven of the twelve students were First Nations students. Ten of the students had computers at home; two students relied solely on being able to use the school computers. Of the ten who had computers, six had high-speed internet at home and four relied on dial-up.

For the purposes of reporting the results, I have used median scores as the measure of central tendency for several reasons. First, the data from my Likert scale questionnaire were ordinal, not interval. While there is a fixed sequence among the numerical points (1 strongly disagree – 2 disagree – 3 undecided – 4 agree – 5 strongly agree), the intervals between the points are undefined and I did not assume the intervals were equal. Second, the median is a more robust measure of the average response. Unlike the mean, the median is not affected by outlying scores. Third, the purpose of the questionnaire was to support the qualitative data. I only needed the median scores to provide this support. The median scores for all responses were very positive ranging from 4 (*agree*) to 5 (*strongly agree*) except for one response. Students gave a median response of 2 (disagree) to the statement, "Electronic portfolios have taken up too much of my time". The data presented in this survey begin to highlight the effects of using electronic portfolios and suggest that students found using electronic portfolios very positive which implies evidence for one of my supporting questions that enquired

whether students saw advantages to using electronic portfolios. Further interpretation of my data will be given in chapter 5.

Midterm questionnaire

The data in Table 1 suggested that half-way through the course, students positively viewed the use of technology for building electronic portfolios. The data begin to answer one of the research questions "What are the advantages to using electronic portfolios?" By the midterm of the course, 91% of the students agreed or strongly agreed that their ability to use technology had improved and that electronic portfolio technology allowed them to make changes to their work. However, responses to these statements became more negative by the end of the semester (see Table 5).

Table 1.

Midterm student response summary to statements that address the theme of technology

	1	2	3	4	5	Median
Using electronic portfolios has improved my ability to use technology	-	1	-	3	8	5
Electronic portfolios have been easy to use	-	-	1	4	7	5
Electronic portfolios have taken up too much time	3	6	2	1	-	2
Electronic portfolios have allowed me to make changes to my work	-	-	1	7	4	4

Note. Responses are made on a five- point scale rating (1 = strongly disagree, 3 = undecided, 5 = strongly agree.)

The data in Table 2 continue to highlight some of the advantages of using electronic portfolios. Two clear advantages recognized by the students were that

Table 2.

Midterm student response summary to statements that address the theme of organization

	1	2	3	4	5	Median
Using electronic portfolios has helped me keep my work organized.	-	-	-	6	6	4.5
Electronic portfolios have helped me take care of my work.	-	-	3	6	3	4
Electronic portfolios have given me the space I need to store my work	-	-	-	2	10	5

Note. Responses are made on a five- point scale rating (1 = strongly disagree, 3 = undecided, 5 = strongly agree.)

electronic portfolios supported them keeping their work organized, and portfolios provided plenty of space for students to store their work. The advantages of using electronic portfolios to support organization became particularly apparent among the two males in the study. This finding was evidenced in the qualitative data.

Interestingly, despite the very positive responses in the first two tables related to the technology used and the benefits electronic portfolios offered in organization, the data in Table 3 suggest that students had mixed feelings about whether they felt motivated to use electronic portfolios. Forty percent of the students were either unsure or disagreed that electronic portfolios helped them remain interested in their work. A further 33% were unsure or disagreed that electronic portfolios allowed them to share their work with others. During the interviews, I specifically asked students if they believed electronic portfolios allowed them to share their work. The responses to this question are provided in the qualitative section of the chapter.

Abrami et al. (2008) argued that electronic portfolios are learning tools that support a variety of metacognitive processes. These processes are self-evaluation, reflection, and presentation of one's work. The data in Table 4 suggest that the electronic portfolios do support these processes. I noted that 91% of the students agreed that electronic portfolios helped them demonstrate their strengths. Furthermore 75% of the students agreed or strongly agreed that electronic portfolios helped them to set personal learning goals and use feedback to improve their learning and to set learning goals. These data begins to answer the first part of my research question "Can electronic portfolios be used to support deep learning?"

Table 3.

Midterm student response summary to statements that address the theme of motivation

	1	2	3	4	5	Median
Using electronic portfolios has helped me remain interested in my work.	-	1	4	6	1	4
Electronic portfolios have helped me share my work with others	-	1	3	4	4	4
I will continue to use electronic portfolios	-	-	3	8	1	4

Note. Responses are made on a five- point scale rating (1 = strongly disagree, 3 = undecided, 5 = strongly agree.)

My main research question is "To what extent are electronic portfolios effective classroom tools for supporting deep learning and assessment?" and my other questions are "What are the benefits to using electronic portfolios?; What are the disadvantages to

Table 4.

Midterm student response summary to statements that address the theme of deep learning

	1	2	3	4	5	Median
Electronic portfolios have helped me demonstrate my strengths	-	-	1	11	-	4
Electronic portfolios have been useful tools for supporting my learning.	-	-	3	7	2	4
Electronic portfolios have helped me identify areas needing improvement	-	-	2	6	4	4
Electronic portfolios have helped me set personal learning goals	-	-	3	6	3	4
Electronic portfolios have helped me use feedback to improve my work.	-	-	3	5	4	4

Note. Responses are made on a five-point scale rating (1 = strongly disagree, 3 = undecided, 5 = strongly agree.)

using electronic portfolios?; and "Do the advantages outweigh the disadvantages?" Using only the midterm questionnaire responses as a guide, I conclude that the electronic portfolios did support deep learning, and that some of the advantages of electronic portfolios center around the use of technology (see Table 1) and organization (see Table 2). However the final questionnaire showed a slightly negative shift in several of the responses, and while the median response remained positive for all statements (3.5-5), some of the negative shifts will be discussed and then the reasons for these shifts will be explored as revealed in the qualitative data and in the discussion of the results.

Final questionnaire

The final questionnaire (Tables 5, 6, 7, and 8) remained unchanged from the midterm questionnaire. It was given to all 12 students at the end of the course. The student responses were grouped under the themes that arose in this study: *technology*, *organization*, *motivation*, and *deep learning*; and median scores were used as the measure of central tendency (see Tables 5-8). The individual student responses showed a slightly negative shift from those on the mid-term questionnaire, but continued to remain positive overall. The median responses to all statements remained between 3.5 and 5. This section will compare the significant changes in student responses between the midterm questionnaire and the final questionnaire, specifically comparing Tables 1and 5, 2 and 6, 3 and 7, and 4 and 8.

The data in Table 5 suggest that students completed the course feeling positive about working with technology to build their portfolios. However, there was a slightly negative shift in student responses between the midterm questionnaire (see Table 1) and the final questionnaire (see Table 5). The shifts occur in three statements and are most pronounced in relation to the two extremes (1- strongly disagree and 5 - strongly agree) of the Likert scale. By the end of the course fewer students strongly agreed that electronic portfolios had improved their ability to use technology, or had been easy to use and fewer students strongly disagreed that electronic portfolios had taken up too much time.

By the end of the course, students continued to agree that electronic portfolios helped them to keep their work organized. The median responses to each statement

Table 5.

Final student response summary to statements that address the theme of technology

	1	2	3	4	5	Median
Using electronic portfolios has improved my ability to use technology	-	-	-	6	6	4.5
Electronic portfolios have been easy to use		-	1	8	3	4
Electronic portfolios have taken up too much time	1	7	2	2	-	2
Electronic portfolios have allowed me to make changes to my work	-	-	1	7	4	4

Note. Responses are made on a five- point scale rating (1 = strongly disagree, 3 = undecided, 5 = strongly agree.)

remained at 4 and 5, but it is not until I examined the individual responses that I noticed a slightly negative shift from students strongly agreeing with the statements (5) to students agreeing (4) with the statements. The data helped to answer the research question "what are the advantages to using electronic portfolios" by continuing to suggest that there are good organizational advantages to using electronic portfolios.

At the end of the course, there remained a significant amount of uncertainty among the students that electronic portfolios helped them to remain interested in their work and that they would continue to use electronic portfolios in the future. Of particular interest was the response to the final statement "I will continue to use electronic portfolios". Other studies (cf. Stansberry & Kymes, 2007) reported slight increases in students feeling they would continue to use electronic portfolios. My study has found a

Table 6

Final student response summary to statements that address the theme of organization

	1	2	3	4	5	Median
Using electronic portfolios has helped me keep my work organized.	-	-	-	7	5	4
Electronic portfolios have helped me take care of my work.	-	1	1	6	4	4
Electronic portfolios have given me the space I need to store my work	-	1	-	3	8	5

Note. Responses are made on a five- point scale rating (1 = strongly disagree, 3 = undecided, 5 = strongly agree.)

slight decrease. The median response in the midterm questionnaire was 4. By the end of the course it had dropped to 3.5.

Table 7.

Final student response summary to statements that address the theme of motivation

	1	2	3	4	5	Median
Using electronic portfolios has helped me remain interested in my work.	-	1	4	7	-	4
Electronic portfolios have helped me work with others	-	1	1	7	2	4
I will continue to use electronic portfolios	-	-	6	5	1	3.5

Note. Responses are made on a five- point scale rating (1 = strongly disagree, 3 = undecided, 5 = strongly agree.)

Possible causes of this drop may be that in the midterm questionnaire, the novelty effect influencing students' attitudes to the use of portfolios. By the end of the course, this effect had worn off. Additionally, students could have felt that electronic portfolios were too much work to maintain as the course progressed. I will discuss both of these possible influences in analysis of my data.

The median response continued to remain positive and suggested that the electronic portfolios did support deep learning (see Table 8). Looking closely at the individual responses in Table 8, it is appears that, by the end of the course, there was a significant amount of uncertainty about the portfolio's ability to support deep learning. The most significant change occurred in response to the statement "Electronic portfolios have helped me demonstrate my strengths." Table 4 shows 11 students agreed with this statement and one student was uncertain. Table 8 shows six students agreed and five students were uncertain about this statement. The qualitative data presented in the following section help to explain this shift.

As with the shift in responses between Table 3 and Table 7, one possible cause of this shift in student responses could be the novelty effect. At the start of the course, all the students had a basic understanding of how to use Microsoft PowerPoint. As their skills in using Microsoft PowerPoint to build portfolios developed, they may have felt positive about electronic portfolios. Towards the end of the course, several students were expressing feelings that they felt limited by the PowerPoint technology and this may be

Table 8.

Final student response summary to statements that address the theme of deep learning

	1	2	3	4	5	Median
Electronic portfolios have helped me demonstrate my strengths	-	1	5	6	-	4
Electronic portfolios have been useful tools for supporting my learning	-	-	3	7	2	4
Electronic portfolios have helped me identify areas needing improvement.	-	1	2	6	3	4
Using electronic portfolios has helped me set personal learning goals.	-	1	4	6	1	4
Electronic portfolios have helped me use feedback to improve my work	-	1	4	6	1	4

Note. Responses are made on a five-point scale rating (1 = strongly disagree, 3 = undecided, 5 = strongly agree.)

reflected in their responses. The novelty of using this program may have diminished after daily use.

Summary

In this section, the data gathered from the midterm and final questionnaire were presented in tables. The midterm data was presented first (see Tables 1-4) followed by the end-of-course data (see Tables 5-8). Tables 1 and 5, 2 and 6, 3 and 7, 4 and 8 were compared. The median responses in the final survey like the median responses in the midterm survey remained positive; however, there was a slightly negative shift to the individual responses throughout the final survey except for responses to two statements

"Using electronic portfolios has helped me make changes to my work" and "Electronic portfolios have been useful tools for supporting my learning". Here the responses remained unchanged from the midterm to the final survey

Both surveys suggested that students positively viewed using electronic portfolios. There appeared to be many advantages to using electronic portfolios and few disadvantages as perceived by the students. Both surveys also suggested that electronic portfolios can support deep learning. Students agreed that electronic portfolios helped them to remain organized in their work, identify areas needing improvement, set personal learning goals and make changes to their work. However, in the second questionnaire there was a slightly negative change to the students' responses. The qualitative data help to explain this negative shift, highlight the disadvantages to using electronic portfolios, and better answer the question as to whether electronic portfolios can support deep learning and the need for assessment.

Qualitative Research Findings

The following section presents the qualitative research data generated from my journal, interviews with six semi-randomly chosen students, the comments made on the surveys, and the finished showcase portfolios. While reviewing this data, I kept in mind the prominent areas of research I had uncovered in my literature review: portfolios as tools for assessment, the technical quality, the effects, the fairness, and the feasibility of electronic portfolios. Foremost were my research questions: To what extent are electronic portfolios effective classroom tools for supporting deep learning and assessment? and What are the benefits of using electronic portfolios? What are the disadvantages to using electronic portfolios? and

Do the benefits outweigh the disadvantages? I identified six themes in my data. Table 9 summarizes these themes and is followed by an in-depth discussion of each theme.

When the course ended, and my journal, the interviews, and the open-ended questions in the questionnaire were complete, these data were transcribed using Microsoft Word and then copied into NVivo 8. Data were read and re-read and sections were collected under six themes (see Table 9): technology, organization, motivation, buy-in, assessment, and deep learning. The themes were used to produce conclusions that addressed the research question.

Technology referred to the students' abilities to use the electronic software to build their portfolios. When one student indicated that using Microsoft PowerPoint to build her portfolio was easy, this response was coded as technology. When another student stated that it was frustrating to have to use the web browser FireFox to access and edit her wiki because the web browser Internet Explorer would only allow her to view her wiki and not edit it, this response was coded as technology. *Deep learning* referred to learning that engaged students in reflection about their learning. One student wrote "...at first I felt my presentation on Greek mythology was well done, but when I received feedback from you (the teacher) and saw what other classmates had done, I realized how I could improve my presentation" . This response was coded as deep learning. *Organization* referred to students being able to use their electronic working portfolios to keep their work organized. When one student said that he liked using the working portfolio to store his work because it was easier to find at a later date, this response was coded as organization. *Motivation* referred to the students being able to identify why creating a portfolio was worthwhile. One participant wrote that he liked

Table 9

Theme type and frequency of journal, interview, and written comment responses

Theme	Frequency
Technology	62
Deep learning	26
Organization	20
Motivation	20
Assessment	20
Buy-in	18

using portfolios because they helped made him want to do more and do it better. This response was coded as motivation. *Assessment* referred to both formative and summative assessment. When I wrote in my journal that I appreciated the ability to work individually with students, looking back on past work and using that work to improve on future assignments, it was coded as assessment. *Buy-in* referred to how the students viewed the portfolio; this theme was influenced by the way in which the portfolio was promoted. Without proper promotion of the portfolio explaining the purpose for its creation, showing examples of good portfolios and including a demonstration of the benefits of portfolio creation, students would not view their portfolios as meaningful and would tend to regard them as no more significant than any other assignment (Tosh et al. 2005). For example, one participant indicated that she initially felt that her portfolio was "just another assignment" on which she expected to get marked. This comment was coded as buy-in. .

Technology

In the early stages of the study, in September, 2009, I experienced frustration and several challenges in using the technology to build a reliable system for creating, storing and presenting electronic portfolios with my students. One of the first challenges was deciding which program I should use with the students to build the portfolios. The second challenge was in finding a reliable method of storing the portfolios. The third challenge centered on access to reliable computers and support from technicians so that programs were available and computers functioning. However, once these challenges had been addressed both the students and I began to have very positive experiences using the portfolios.

In September, 2009, I had built a portfolio template using Microsoft FrontPage, a web editing program that was available on the school computers the previous year. Students used this template to build and present their portfolios. I had chosen to use this FrontPage template for several reasons. I was familiar with the FrontPage program and could teach my students to use it. The template I built was straightforward and simple to use and our school computers had Microsoft FrontPage. This program would also allow students to post their portfolios on the internet, making their work visible to a large audience, an important and necessary element of portfolios (Avraamidou & Zembal-Saul, 2002).

Over the summer of July, 2009 – September, 2009, the school district's technology infrastructure was being overhauled. By the start of the school year, the school computers no longer had a web editing program on them. The FrontPage template

I had designed could not be used. Despite several maintenance requests by me and other teachers to have a web editing program installed on the computers, this request never happened. Almost daily, I recorded in my journal feelings of frustration over the lack of necessary computer programs and lack of technical support. I once wrote:

> I am frustrated that I cannot get access to Microsoft FrontPage or any other web editing program for that matter. The lack of technical support is laughable. Right now I feel I can answer some of my research questions: Electronic portfolios are proving to be nothing more than technological headaches. Without support from technicians and access to the necessary computer programs, there appear to be no advantages to using electronic portfolios and numerous disadvantages (journal entry).

By October, 2009, I had decided to give up my idea to build portfolios using a web editing program and looked at other possible programs for building the portfolios. Keeping in mind that I wanted students to be able to personalize their work, create hyperlinks, showcase their work to a large audience, and that I did not want to spend time learning how to use a new program and or spend money purchasing a new program, I had a choice of using either wikis or Microsoft PowerPoint. I chose Microsoft PowerPoint to build and showcase the portfolios since I was most familiar with this program. Microsoft PowerPoint was installed on the school computers and all of my students already had some experience with it. Once I had committed to using Microsoft PowerPoint I began to relax and experience some success with the portfolios. I wrote in my journal:

> Although this is not my first choice, I am relieved to have chosen Microsoft PowerPoint simply because my class can begin to build the portfolios. Most students are familiar with this program and can work on their projects and build their portfolios with little assistance. Students are teaching one another how to use Microsoft Power Point, and I can spend my time working with students who have less experience building power points (journal entry).

Once the students were building their portfolios, I was faced with the challenge of storing their work. Initially, I had chosen to give students discs to store their work. These were inexpensive and portable. I purchased a case of CDR discs and immediately ran into several problems. The first problem was that not all the computers had disc drives that worked. Students and I were both frustrated when the computers could not read the discs or save work to the discs. Another problem that arose with the CDR discs was that once students had found computers with functioning disc drives, they had difficulty saving to which work they had made changes. When students tried to save their work they received a computer message that stated work could not be saved because the file was a "read only" file. A colleague of mine who teaches computer courses took me aside and said:

> You need to use discs that are labeled CDRW not CDR. But really you could run into a lot of frustration using discs. Students will lose the cases, scratch their discs or even break them and not all the school computers have disc drives that work. If you can, get the students to use thumbdrives. These are more expensive, but they are much more robust than discs, easier to use, and can be used on all our computers. Plus, students like using thumbdrives. They think they are very cool. (journal entry)

I purchased thumbdrives for all the students and my colleague was correct. The thumbdrives were simple to use and the students were thrilled to be given thumbdrives to work with and to keep once the course was completed. Students said, "Mr. Newbery, the thumbdrives are fantastic." (journal entry) and "I really liked using the thumbdrives, and being allowed to keep them is great." (interview).

The final challenge I faced in creating a reliable system to build, store and present the portfolios was in accessing reliable computers. Our school has a computer lab

consisting of 25 computers. This lab was simply not working for the first two months of school. By October I had to find other computers for my students to use, as it seemed the computer lab would never be fixed. The school library was one area that had enough functioning computers for my students.

The library computers are set up in cubicles providing each individual with some privacy. This made teaching the class as a whole very difficult as it required that I move from one student to the next as opposed to addressing the entire class. I was thankful that I had chosen to use Microsoft PowerPoint because, as I recorded in my journal:

> Many students know the Microsoft PowerPoint program well enough to work independently. A few are confident enough with the program to be able to help other students, leaving me free to work with individuals who have little experience using the program. (journal entry)

By mid -October the computers in the computer lab were all working. I moved my class into the lab and was able to teach the class as a whole how to use the more advanced features of Microsoft Power Point, like creating hyperlinks. We were able to address colour schemes and considerations around design of the PowerPoints.

As I was working one-on-one with students, I constantly had to chase a few students off sites that they should not have been accessing. These were Face book, MSN, and YouTube. Several requests by me and other teachers had been made to have these sites blocked, evidence that this behavior was not linked exclusively to this class project. These programs were never blocked throughout the semester in which my course was offered, another source of frustration for me.

By mid-October, students had thumbdrives on which to store their work, everyone had a good understanding of how to use Microsoft PowerPoint to build their working portfolio and to store their work and the computers in the computer lab were all working. With these three challenges addressed, we began to have very positive experiences using technology to build the portfolios. My level of frustration decreased and I began to feel more positive about the research and use of portfolios. The possible benefits of the use of electronic portfolios became more apparent as problems with its use decreased. The remaining five themes of, organization, motivation, buy-in, , assessment, and deep learning, were being demonstrated by student activity and my involvement with the class as increasing class time was spent working successfully with the electronic portfolios, and technological impediments diminished.

Deep learning

The second part of my research question was "Can electronic portfolios support deep learning?" In this section of the chapter, I will delineate the process I followed to better define deep learning. Then I will present the data collected from student reflections, my journal entries, and interviews that addressed my research question.

To begin answering my research question, I realized early on that I really had to have a solid understanding of what deep learning was and how it could be supported with electronic portfolios. I turned back to my proposal and the professional literature to develop a working understanding of deep learning which I wrote in my journal.

> Barrett (2007) defined deep learning as being metacognitive. Students begin to understand how they learn and develop lifelong learning skills which allow them to continually assess their learning through reflection, plan strategies to approach and

> complete learning tasks and then evaluate the effectiveness of those strategies through reflection.

I understood that deep learning was about students' learning how to learn, and that a significant component of deep learning was reflection on the learning process. However, I was not entirely satisfied with this definition of deep learning and asked some of my colleagues what they believed deep learning was. They all said that they witnessed deep learning not only when students demonstrated they understood how they learned and could plan strategies to approach and complete learning tasks, but also when students could take what they had learned and apply their learning to new situations.

For example, I would witness deep learning in my Comparative Civilizations class when students had studied Greek and Native North American mythology, had recognized similarities between the two mythologies, and could then predict that they would find these similarities in the mythologies of other cultures. Finally I had a working definition of deep learning that I was happy with. I wrote this definition down in my journal and had it prominently displayed on my desk as a reminder.

> Deep learning occurs in two ways. One way is when students learn how to manage their learning. They develop the metacognitive skills that support self regulation of their learning. Students learn how to plan, monitor, and evaluate the success of strategies they used to complete learning tasks. The second way deep learning occurs is when students are able to take what has been learned and apply it to new situations.

Equipped with a definition of deep learning with which I was happy, I next looked at the reflections that students had written about their work. Avraamidou and Zembal-Saul (2002) noted in their study that student reflections changed over time moving from being descriptive to being explanatory. One phenomenon for which I looked, as the year progressed, was a similar change in my students' reflections. All of the reflections in the

first several assignments were very brief and descriptive. When asked what they had done well and what they would change in the future. Responses were,

> I liked the colour choice I made in this project, and my use of pictures to support my written work. I think next time I will choose a different font to write in because this one was difficult to read. (student interview)

Another reflection stated "My project is not cluttered with special effects. I used them sparingly. I don't think I would change anything next time" (student journal). As the course continued, students' reflections remained descriptive but they did become more thoughtful. One student wrote

> I chose to focus on contributions India has made to mathematics and science and I chose to present this as an essay. I learned a lot doing this but realize now that a powerpoint presentation would have been a better way to present this rather than an essay. (student journal)

Another student wrote:

> I thought that I had done a good, detailed job of discussing the similarities between the Christian Ten Commandments and Buddha's teachings. When I read your (teacher) comments I realized that I could have gone further and rather than listing similarities between the two, I could have discussed how these commandments could have influenced the cultures of North America and India. (student journal)

In response to these reflections, I wrote in my journal

> I had expected reflections at the start of the course to be descriptions of student work and had hoped that as the course progressed the reflections would change in two ways. I would see students write explanations of their work and begin to apply what they had learned to new situations. This does not appear to be happening. However I am seeing self -evaluation in the reflections suggesting that students are using feedback to improve their work.

During the interviews with students I asked them if they felt the electronic portfolios helped them identify areas needing improvement and use feedback to improve their work. One student responded "I liked the reflections at the end of my projects.

They helped me to think about what I did well and to think about how I could improve my next project." A second student said "I liked the electronic portfolios because I could use them to quickly look back on past assignments and use them to make improvements on future assignments. I saw changes to the way I collected and presented information."

In summary, I first developed a definition of deep learning. I defined deep learning as occurring in two ways. Deep learning occurred when students had learned how to support their learning, and it also occurred when students were able to apply their learning to new situations. Next, I presented data I had gathered from student reflections, journal entries and interviews. My data suggested that students were developing the metacognitive skills to support their learning: however, I did not see students being able to apply their learning to new situations.

Organization

This section delineates the process the class went through to create a system for organizing student work. It then presents the qualitative data generated from interviews, reflective journaling and student written responses to open ended questions. The data addresses the theme of *organization* and highlights, particularly among the males, student experiences.

When we first began building electronic portfolios in October 2009, keeping work organized was a challenge for students because we had not established a method for saving their work. Students could not save work directly to the school server, saving work to discs was unreliable because not all computers had discs drives that worked and often assignments had to be renamed because they were saved as "read only" files.

Before we had thumbdrives, the most reliable method of saving and storing work was to have the students email their assignments to themselves. Three problems immediately arose with this, some students did not have email addresses, some did not know how to attach their work to an email, and others had more than one email address. Student work continued to be lost, misplaced, or saved on someone else's email. Students were often frustrated that they could not find their work, and that it could take some time to figure out where their work was. I noted once in my journal that "the electronic portfolios were taking the shape of some of my students' binders." One male student said, "I hate this! I forgot to email my work to myself. I lost everything! Now I have to start all over again."(journal entry).

Once my students had thumbdrives to store their work, organization became one appealing advantage of electronic portfolios. The first obvious advantage to electronic portfolios was that they could be stored on small, durable thumbdrives. The size of the thumbdrives made it easy for students to carry with them, and if they were concerned about losing the thumbdrives, they could keep them in a drawer in my classroom.

We used a simple system of organizing the work in the thumbdrives. All students first built a working portfolio that they titled *Comparative Civilizations 11/12*. All work, completed and uncompleted, including essays, photos, PowerPoints, and evaluations, was placed in this working portfolio under titles of units we were studying: *Greece and Rome*, *Western Civilization*, *Asia*. It was easy to keep the electronic files organized, and we could navigate through the work. This method was important for students to follow because later in the course they began to use their thumbdrives to store work from other

courses as well. If they did not follow this system their thumbdrives would begin to resemble their binders.

Students appreciated this system of storing and organizing their work. One male stated in an interview

> I never made electronic folders before. I liked using this system because it was easy to follow and I could keep my work organized. Sometimes my thumbdrive still got messy, but it was a lot easier to "clean- up" than my binder. I just had to click on the assignment and drag it into the appropriate folder. And there are no ripped, torn or lost papers.

We had a simple, effective method for keeping our work organized. The other concern was to keep the work within the projects organized. As students learned more about building electronic artifacts using Microsoft PowerPoint and Microsoft Word, they used more of the features available to them. A variety of colour schemes, fonts, pictures and hyperlinks, were used throughout their projects. These projects became cluttered and disorganized. I wrote in my journal

> There were two levels to organization. At one level we have to have an organized system for storing assignments. At another level we have to have a system for keeping the assignments themselves organized. It is very easy for electronic work to quickly become disorganized with distracting effects, fonts, colours, pictures, and hyperlinks. Fortunately when I sit down with them, it is easy to clean-up these electronic assignments.

I found the most effective method for helping students to keep their individual assignments organized was to show examples of effective PowerPoints, discuss with the class why they were effective PowerPoints, and to work one-on-one with students. We discussed colour schemes, appropriate choice of fonts, and appropriate use of hyperlinks to support navigation through their work. As the semester progressed I could see improvement in the organization of their work and I commented to students, "I can see

growing maturity in the presentation and organization of your work. At the start of the course your projects were cluttered with special effects, now you seem to use the special effects sparingly" (journal entry).

One male student wrote on the questionnaire "I liked all the special effects I could use in my electronic assignments, but I understood that my work could become cluttered with these and I learned to use them sparingly."

In summary, the data about organization began with the question as to whether organization would be one advantage to using electronic portfolios. It became clear that there were two levels of organization. The first level involved ensuring all work was put in the correct place. Students had to have a reliable method of saving and storing their work. If this did not happen, the electronic portfolios were no better organized than their binders. Student work would become scattered all over. The second level of organization involved the projects themselves. Students had to be taught how to use the features available to them in Microsoft PowerPoint and Microsoft Word to build artifacts that were organized presentations of their learning. I realized as I reviewed these data that working with students to organize their projects also supported *assessment for learning* and *deep learning*. Both will be discussed later in the chapter.

Motivation

This section presents data generated from reflective journaling, and student interviews and the open-ended questions in the questionnaire that addressed the theme of *motivation*. Data from the start of the course shows students were motivated to work on their projects, and build their portfolios. Data from the end of the course showed that

students lost some of this motivation. This change in motivation was also shown in the quantified data (see Tables 3 and 7).

At the start of the course, October – November, the students appeared motivated to work on and build their working portfolios. Motivation was apparent as my students expressed enthusiasm for the portfolios and a desire to complete assignments that they could add to their working portfolios. Students arrived to class on time, worked on their assignments and asked regularly to take their thumbdrives home so that they could continue to work on their assignments. I wrote in my journal several times, that "students seemed to think the electronic portfolios they were building were worthwhile. They seem to be taking ownership of their work."

Remembering the motivation students had for completing their artwork and woodwork assignments, I asked students informally how the electronic portfolios compared to these projects and later recorded their comments in my journal. One student remarked that "her electronic portfolio was becoming similar to a portfolio of art work she had: a compilation of completed work and work in progress that she could go back to and build on." Another student commented that "she liked working on electronic artifacts for her portfolio because she felt that there was more opportunity to be creative, to share her work with others and that she was learning new skills she could use in future classes." A third student responded in the midterm questionnaire that "he thought it was fun, he was learning new skills he could use in other classes, so he enjoyed working on his portfolio." (midterm questionnaire). Most students commented in their mid-term

questionnaire that "electronic portfolios were helping them to remain interested in their work and they felt that they would continue to use electronic portfolios in the future."

Students appeared to be motivated to work on their electronic portfolios in much the same way they were motivated to work on their woodwork or art projects. However, some of this motivation may have been due to a novelty effect which I will discuss in chapter five. For now it is important to note that my qualitative data supports the quantitative data (see Table 7) and shows motivation to work on the electronic portfolios decreased as the course came towards an end.

Towards the end of the course I noticed that the motivation students had shown at the beginning of the course for working on artifacts and building their working portfolio was waning. Students began to arrive late. They were not asking to take their thumbdrives home, and it appeared that some assignments were being completed simply to get them done. I talked informally with the students and recorded our discussions in my journal.

> I mentioned that they did not seem to be as motivated to work on the portfolios as they had been early on in the semester. Some students said that they were tired of working on the electronic portfolios and were finding the Microsoft PowerPoint program was limiting their opportunity to become creative. Others said they felt that they were spending too much time in front of the computers. They also said that the electronic portfolios were similar to paper assignments because they were not projects they felt they could share with others.

I recognized that being able to share their work with others was an important motivator for students and realized that the way we were using Microsoft PowerPoint to build and store their portfolios was not providing them with the opportunity to share their work the way they would like. I asked some students if they were interested in building

web pages. "They said no, they had built web pages in the past and found them to be time consuming and difficult." (Journal entry). I introduced some students to wikis, I explained that they could use wikis to build artifacts for their working portfolios and that they might add these artifacts through hyperlinks to their final show case portfolio. "One feature the students liked about the wikis is that they could invite others to view, comment, or contribute to their work," (journal entry).

Students began to look for other methods of representing their learning. They built posters and gave presentations. Then they took digital photos of their work and added these photos, with evaluations of their work, to their working portfolio. In the final questionnaire students wrote that they were uncertain about whether they would use electronic portfolios in the future. Some commented that too much time had been spent on the portfolios, and a few were not certain that the electronic portfolios helped them to remain interested in their work.

In summary, at the start of the course all the students were motivated to build their electronic portfolios. They felt that they were learning worthwhile skills; they believed they had room to be creative, and that they could share their work with others. They believed that electronic portfolios helped them remain interested in their work and that they would use electronic portfolios in the future. Towards the end of the course, there was a negative change in the motivation. Some students felt they were spending too much time in front of the computers. Some felt that Microsoft PowerPoint was too limiting, they could not be as creative as they wanted. A few students felt that their electronic portfolios were no longer helping them to remain interested in their work.

Although further attention will be given to interpreting this data in Chapter 5, I suggest that *the novelty effect* played a role in student motivation at the start of the course and that one reason for the decline in motivation was that the electronic portfolios had not been promoted as well as they could have been.

Assessment

One significant part of my research was related to the question, "Can electronic portfolios be used to support the teacher's need for assessment?" It became clear as I analyzed the data and reviewed my literature that I needed to examine my data under two headings of assessment. Formative assessment, assessment for student learning, was qualitative and ongoing throughout the course. Summative assessment, final assessment of student learning, was quantitative and occurred at the end of a project, at the end of the term, and at the end of the semester. First, I will present data for formative assessment, and then I will present data for summative assessment. I will discuss the interpretation of these data in Chapter 5.

Formative assessment

Assessment for student learning began on the first day of classes. I handed out a course outline, as I do at the start of every course. This outline explained what we would be covering, the units we would work on and a basic marking scheme I would use. It showed that 80% of students' marks would come from completed assignments and 20% of their marks would come from the final showcase portfolio. Students expected to see an outline like this one and accepted without question that 80% of their marks would come from completed assignments. They were however, concerned about 20% of their

mark coming from a showcase portfolio because they did not know what one was. One student commented that "20% was a lot of her final mark for something that I did not know what it was." (student journal). Students agreed that they wanted to see examples of portfolios.

The next day I showed my class examples of PowerPoints they might build and store in a working portfolio. I explained the purpose of a working portfolio and although I did not have an example of a completed showcase portfolio I explained more clearly what one was. I noted in my journal

> I understand that the role of formative assessment is to support student learning and part of that requires providing students with good examples of work they are expected to create. I should have examples of good portfolios to show students. Yet this is difficult to do when it is my first time using portfolios in the classroom. At the end of this course I hope I can keep examples of good work to show future classes. (journal entry)

Before we began building artifacts to place in the working portfolios, I handed out rubrics that I had created and would use to assess student work (see Appendix B). We discussed the criteria: mechanics, presentation, and content; and the standards: exceeding, fully meeting, meeting, minimally meeting. Students were already familiar with similar rubrics from past social studies and English courses and understood how they were used. I had hoped that students would use these rubrics as they worked on their assignments to assess their work themselves. This was not the case. Students set aside their rubrics and did not refer to them until I had made a point of sitting down with them individually and had asked them to pull out the rubric so that we could go through their work together. I wrote in my journal

> It is the same in every course I teach. I hand out and go over the rubrics used to evaluate the assignments. Then students put the rubrics away and ignore them, until I make a point of sitting with each student and we go over the rubric and assignment together.

However, I did note one significant difference between past courses where I have worked with students to assess their work and this course. I wrote in my journal that

> I find the electronic aspect of the portfolios supports formative assessment with rubrics because I can sit down with students one-on-one, go through their assignments with rubrics in hand discussing the criteria and standards and easily make immediate changes to their work so that students have models to follow. The times I have done this in other classes with paper copies of the students' work result in students becoming discouraged and feeling as though they must start all over again. Some students go so far as to crumple up their work and throw it out.

Students also commented in the interviews and on their questionnaires that one aspect they liked about their electronic portfolios was that they could make immediate changes to their work and see the improvement the changes made. One student wrote on her questionnaire

> I like that I can talk with you (the teacher) about how to make my work better and then make the changes quickly and easily. I can see right away that something like the font I chose was a poor choice because it was hard to read.

Once the projects were completed and marked students then placed their assignments in their working portfolios and had these to refer back to as examples of good and bad work. This attribute of the portfolios continued to support formative assessment. One student wrote in her questionnaire "I liked the fact that it was easy for me to look back on past assignments and use those assignments as examples to follow." Another student commented in the interview "I liked having past work so readily available in my working portfolio because I had a record of improvements and changes to my work as my skills with Microsoft PowerPoint and Microsoft Word improved." This

entry was also an example of portfolios supporting deep learning, which I will discuss further later in this chapter and in the next chapter.

Summative assessment

While assessment for student learning is important for teachers supporting student learning, assessment of student learning seems to be the priority of the students and their parents. Students and parents want to know what the marks are. If the marks are, poor they often want to know how they can improve them, and if the marks are good both students and parents are pleased. As I examined the portfolio's ability to support the teacher's need for assessment, I needed to know not only if portfolios could support formative assessment, but also if they could support summative assessment.

I know from years of teaching that summative assessment is very important to students. Often marks are what motivate students to complete the assignments. It was no different in this course. Questions that students often asked were "How much is this assignment worth?; When can we see our marks?; When can we have progress reports?: Am I failing this course?; How can I improve my mark?" (journal entry). One student stated in an interview "I liked keeping the working portfolio. It was a great way to store my assignments. I would not have done a showcase portfolio unless it was for marks" (interview).

To meet the needs for summative assessment I used the same rubrics to evaluate student work as I had given students to guide their building the projects. Students submitted their assignments with their rubrics and personal assessment of their assignments. I gave my assessment of their work and a final mark. Next, as Barrett and

Wilkerson (2004) suggested, I tried to use summative assessment to support learning instead of being a final measure of student learning. I met with students, discussed their marks and provided them with the opportunity to make changes to their work and resubmit it. In this way summative assessment was not a final evaluation of student learning, but rather an evaluation that continued to support student learning. All projects and final evaluations were kept in the working portfolio for students to refer to as they completed future assignments. This was a system I had never used before, and I wrote in my journal

> As soon as I had first written my research question I thought "Part of this question can be answered immediately. I know right now that portfolios will support summative assessment. The projects they contain are like any other projects and are evaluated in the same way: using a rubric to assess and establish a final mark." Now, part way through the course, I realize that the way I am trying to use the portfolios has changed the meaning of summative assessment for me. Up to now I treated summative assessment as final assessment in the learning process. With the portfolios I am trying to use summative assessment along with formative assessment to support student learning. In this way summative assessment is not final at all but another tool to support learning.

In summary, part of my research question was "Can electronic portfolios be used to support assessment?" I broke assessment into formative assessment and summative assessment and defined each. Then I presented data I had collected for formative assessment first. This data suggested that electronic portfolios supported formative assessment as they allowed for student and teacher discussions and tracking changes to student work. Next I presented data that I had gathered for summative assessment. I noted that electronic portfolios supported summative assessment in a way that was unique to me. I no longer considered summative assessment as final assessment but rather as one more tool to support student learning.

Buy-In

This section presents the qualitative data generated from journal entries and interviews that addressed the theme of *buy-in.* I define the term *buy-in.* Then I present data which outlines my struggle and failure to promote the electronic portfolios.

Buy-in refers to how portfolios are promoted to students. Portfolios can be extrinsically promoted or intrinsically promoted. Extrinsic promotion is institution directed and often relies on using marks to promote assignments, while intrinsic promotion is directed by the learner and it relies on students understanding the relevance of the assignments for supporting their learning (Barrett & Wilkerson, 2004). As a teacher, I always try to intrinsically promote my assignments, but in the end, I often rely on using marks as extrinsic motivators to get the assignments completed. Indeed, marks are what students expect to see. They ask to see marks at the end of assignments, at midterm and at the end of the course. As a teacher I find extrinsic promotion is very easy and intrinsic promotion is much harder.

I wrote in my journal about my struggle to intrinsically promote the electronic portfolios.

> Tosh, Light, Flemming and Heywood (2005) stated that to promote electronic portfolios intrinsically, teachers need to have examples of good portfolios to show students. I do not have any examples of electronic portfolios to show these students. I think electronic portfolios can be powerful tools for supporting student learning and I hope they are viewed as tools they can use in the future rather than as assignments to be done because the teacher expects it and there is a mark at the end of it. But I do not have examples of others who have used them, I do not have examples to show them, and there is no one else on staff working with electronic portfolios.

Evidence showing that the electronic portfolios were never well promoted can be seen in student's written comments and in the interviews that were given at the end of the course. One student commented in the questionnaire "I would have liked to have seen other examples of portfolios and understood more about how they could be used in other ways." Another student said in an interview "I understood that electronic portfolios were to help my learning, but what I really wanted to see were my marks on the projects and on the showcase portfolio." Further in the interview students were asked "Can you think of other courses that you might use electronic portfolios in?" One student replied "No, I can't see how I would use electronic portfolios in other courses." (interview). A second student said "I can't really think of a way I could use electronic portfolios in other classes...well, maybe I could use them in English or history. I would need the teacher to let me use them." When she was asked if she thought her teachers would let her build electronic portfolios she replied

> They might, but my teachers just want paper copies of my work. I don't know if they would give me time to work on the computers. They (teachers) would probably have to give me the option of using electronic portfolios.

This interview raised an important point about promoting electronic portfolios. That is that it would be much easier to promote the portfolios if other teachers on staff used them, or at least saw value in them. I talked to some staff members about electronic portfolios and they often viewed them in a negative manner. They said that they would not take students to the school computers to work on portfolios; they preferred paper and pen assignments, tests and exams. They viewed technology as something that they would leave to be taught in computer classes not in social studies, English, science or math.

Towards the end of the course I had several informal discussions with students concerning how I might better promote electronic portfolios in the future. All the students had suggestions to offer. I wrote these suggestions in my journal. They include: showing examples of good electronic portfolios, demonstrating the benefits of electronic portfolios, demonstrating how the portfolios might be used in other courses, having people from the community talk about how they use portfolios, my building an electronic portfolio along with the students and showing them how my portfolio is developing.

In summary, this section first defined the term *Buy-in*. Then it presented data that highlighted my struggle and failure to promote electronic portfolios in a way that students were intrinsically motivated to complete them. I noted that I did not have examples of portfolios for students to look at, and that no other teachers were using portfolios. Students ended the course unsure of how they could use electronic portfolios in other classes, and feeling that they would need support from their teachers to build electronic portfolios in the future.

Chapter Summary

Quantitative and qualitative data were collected during the course of the research. Six themes were revealed by these data, technology, organization, motivation, buy-in, assessment, and deep learning. Quantitative data were gathered through a mid-term questionnaire and a course end questionnaire, the data was then grouped under four of the themes, technology, organization, motivation and deep learning. While there was a slightly negative shift in individual responses between the midterm and the final questionnaire the median responses continued to remain positive.

Qualitative data were generated from a personal journal, interviews with six students, student reflections, student responses to open-ended questions on the questionnaire, and the final showcase portfolio. These data continued to answer the questions, what are the benefits and disadvantages to electronic portfolios and the main research question? and to what extent are electronic portfolios effective classroom tools for supporting deep learning and assessment? Six themes, *technology, deep learning, organization, motivation, assessment,* and *buy-in* were identified as the data were reviewed. Table 9 presents the six themes and the frequency with which those themes occurred in the data.

Under the theme of *technology*, three challenges were identified: finding a reliable program to build portfolios with the students, finding a reliable method for storing the portfolios, and having consistent access to reliable computers and technician support. Once these challenges had been addressed, the benefits of electronic portfolios become apparent.

Deep learning was defined as occurring in two ways. One way was metacognitive development among students and the other way was as an ability to apply learning to new areas. Data from student reflections and interviews were presented. The data suggested that metacognitve learning was supported through the electronic portfolios. However, I did not find data that suggested students were able to apply their learning to new situations.

The theme of *organization* was presented next. Organization occurred on two levels. The first level was the macro level of organizing the storage of all finished and unfinished assignments. The second level was the micro level of organizing the

presentation of the work within each assignment. All students, particularly the males, spoke positively of using electronic portfolios to organize their work.

Next, I presented data under the theme of *motivation.* My data showed that initially students were motivated to build their electronic portfolios. They stated they were learning new skills, motivated to complete their assignments, and felt that the Microsoft PowerPoint allowed them to share their work with others. The quantitative data showed a slight decrease between the midterm median responses under motivation and the final median responses. (See Tables 3 and 7). The qualitative data helped to explain that decrease. Students felt that too much time was spent working on the portfolios, and that Microsoft PowerPoint was too limiting, and that they were not able to share their work with others.

Under the theme of *assessment,* I defined formative assessment and summative assessment. I presented data that demonstrated electronic portfolios could support formative assessment as well as summative assessment. I noted that I found with electronic portfolios, summative assessment did not have to be final assessment, but could continue to be used to support student learning.

In the next chapter, the interpretation of these findings will be presented. As will be shown, my data supported my research questions and have provided valuable insight into the use of e-portfolios with high school students.

The last theme was *buy-in.* I first defined the term *buy-in.* Then I presented my data that showed my struggle with intrinsically promoting the electronic-portfolios. I noted that I did not have examples of completed portfolios to show students, I had no one to

talk to the students about the value of electronic portfolios, and no one else on my staff was using electronic portfolios, or had indicated that they would encourage students to use them.

CHAPTER FIVE: DISCUSSION

Chapter 1 introduced the research problem and the research question which examined the extent to which electronic portfolios were effective classroom tools for supporting deep learning and assessment. Chapter 2 surveyed the research on the use of electronic portfolios to support deep learning and assessment. Chapter 3 outlined the research methodology, discussed the action research, and concluded with an overview of research tools. Chapter 4 outlined the qualitative and quantitative data that were collected during the course of the research. This chapter will discuss the findings derived during the data collection phase of this study. Quantitative data gathered from the midterm and course end surveys and the qualitative data gathered throughout the semester in the form of interviews, a reflective journal and student written responses will be discussed. This discussion will be guided by the research question that examined the extent to which electronic portfolios were effective classroom tools for supporting deep learning and assessment.

Study Findings

Carney (2004) stated that while there is strong theoretical support for the use of electronic portfolios, there is little empirical evidence to document the effects of portfolios in the classroom. Further, Zeichner and Wray (2001) expressed a similar concern and argued that there are few studies that examine the consequences of portfolio use for assessment and student learning. Additionally, Tosh, Light, Fleming, and Heywood (2005) stated that much of the research available on the use of electronic portfolios focuses on faculty perspectives and very little on student perceptions of the

value of electronic portfolios. Tosh et al. argued that student perspective needed to be explored. The quantitative data gathered in the midterm and final questionnaires and the qualitative data gathered from interviews, written responses and my reflective journal attempted to address these concerns. The following section will discuss the results of the data gathered in this study under the themes of *technology, deep learning, organization, motivation, assessment,* and *buy-in.*

Technology

Montgomery and Wiley (2004) suggested that the advantages of electronic portfolios tend to be student-centred and the disadvantages tend to be teacher-centred. I found that both the advantages and disadvantages to electronic portfolios began with technology in that it was through technology that the advantage of being able to easily make changes to work was realized for the student. This finding would later prove to support *organization, assessment*, and *deep learning*. Also the disadvantages of needing access to reliable computers, technical support and needing to select an appropriate portfolio system existed because of the electronic aspect of the portfolios. These disadvantages existed for me – as the teacher - before the course began and continued throughout the course.

First, I will discuss the advantages to using electronic portfolios. Then I will discuss the disadvantages. My discussion will begin with quantitative data collected in the midterm survey under the theme *technology* and compare it with the final survey. Then I will present the qualitative data.

Students were asked to respond on a Likert-scale (1 strongly disagree – 5 strongly agree) to the statement "Using electronic portfolios has improved my ability to use technology". Only one of the twelve students disagreed with this statement. All others either agreed (4) or strongly agreed (5) and the median response was 5. The final survey continued to show positive responses to this statement. Students either agreed or strongly agreed with this statement. The median response was 4.5.

These responses suggested that one advantage to using electronic portfolios was that students felt it improved their use of technology. However, it is interesting to note that towards the end of the course student response to using technology showed a slight negative sift from a median of 5 to 4.5. Tosh et. al (2005) observed a similar sift in student response using the technology in their study.

Tosh et al. found that when students began to build electronic portfolios, they wanted structured systems to build their portfolios but as their skills developed they began to want more open systems that would give them more freedom for customizing their work. Microsoft PowerPoint is a structured system that my students may have preferred to use at the beginning of the course, as they became more skilled using PowerPoints they may have wanted a less structured system so they viewed the software they were using less favorably at the end of the course.

A second advantage to using technology, and perhaps a more significant advantage, was that the technology allowed students to quickly and easily make changes to their work. On both questionnaires students agreed or strongly agreed that using the technology allowed them to make changes to their work. There was no change between

the responses on the midterm questionnaire and the final questionnaire. One student wrote on the questionnaire

> I like that I can talk with you (the teacher) about how to make my work better then make the changes quickly and easily. I can see right away that something like the font I chose was a poor choice because it was hard to read.

Being able to quickly and easily make changes to work was a significant advantage of technology for both student and me. With my feedback students could improve their work and have models of good work readily available for reference. I found that this advantage supported *organization, assessment* and *deep learning.*

I found the disadvantages began long before the students started to use the portfolios. They began when I had to select a program for building the electronic portfolios. This process of program selection was exacerbated by my inexperience with computers and the programs available for building electronic portfolios. Once the program was in place other disadvantages such as student access to computers, and storage of artifacts arose. Many of the disadvantages: such as, student access to computers, storage and retrieval of artifacts, continued to be an everyday reality throughout the course.

During the early stages of the study, I wrote in my journal that some of the disadvantages I experienced were first, the frustration and challenges in using the technology available to build a reliable system for creating, storing and presenting electronic portfolios and second, were in providing students with access to reliable computers in a setting that supported classroom teaching. The portfolio template I had

built and intended to use required the web-editing program Microsoft FrontPage. This program, was no longer available on the computer system at our school. Despite several requests to have Microsoft FrontPage installed back on the system, this never happened. Several of my early journal entries expressed my frustration. I once wrote,

> My principal and I have both requested that Microsoft FrontPage be reinstalled on the server. This has not happened. The time I spent building a FrontPage template for this course may have been wasted. I am frustrated by the lack of technical support.

My first challenge was to find another program for building the portfolios. I could have used other web editing programs or wikis, but because I was inexperienced with using web editing programs and not familiar with wikis, I settled on using Microsoft PowerPoint. The next challenge was to have a reliable method for storing the portfolios and artifacts. Limited by funding and again by personal experience, I purchased discs, which were, inexpensive and labeled CDR. I later discovered that these would not allow students to save changes to their work. A colleague of mine pointed out that I needed to use discs labeled CDRW, and also that not all the school computers had disc drives that worked. I settled on using thumbdrives as our storage devices. My wife was shocked that I was purchasing thumbdrives for my students. I wrote in my journal "What else can I do? Saving work to the school server is unreliable, assignments have already been lost. And I do not understand how to use the discs."

The next significant challenge to using electronic portfolios in the classroom was having access to reliable computers for all students in a suitable classroom setting. The computers in my school's computer lab were not working for the first two months and I

had to find other computers for my students to use. We ended up using the computers in the school library – a setting that was awkward for supporting more than two students at a time. My journal entries continued to express frustration over the lack of necessary computer programs and technical support. I once wrote "the lack of technological support is laughable...electronic portfolios are proving to be nothing more than technological headaches." I was inexperienced with electronic portfolios and the technology I needed to use and I had no community of support.

Barrett (2007) argued that there are unique challenges facing the single teacher using portfolios in a school site; namely, that there is no community of support. Certainly the challenges of finding a reliable system for building and storing the electronic portfolios rests solely with the teacher building the portfolios and is exacerbated by a lack of knowledge around computers and the programs available such as wikis and other web editing programs. These are challenges that would diminish with a larger community of support.

To summarize, the advantages to using electronic portfolios were realized when students felt that their ability to use technology improved and when we found how easy it was to edit their work. The disadvantages to using electronic portfolios began were realized before students started creating the electronic portfolios. The disadvantages lay in finding a program to create the electronic portfolios, establishing a reliable method for storing the artifacts and in having consistent access to reliable computers. These problems were exacerbated by the lack of support and by my inexperience with the technology. Although there were significantly frustrating disadvantages to using

technology to build the electronic portfolios, I found the disadvantages were outweighed by the advantages which became more apparent under the themes of *organization, motivation, buy-in, assessment, and deep learning.*

Deep Learning

Part of my research question was "can electronic portfolios support the students' need for deep learning?" Most of the literature I reviewed (e.g., Avraamidou & Zembal-Saul, 2002; Barrett, 2007; Brown, 2002; Wetzel & Strudler, 2006) suggested that electronic portfolios can be powerful tools for supporting deep learning when they support the following aspects of learning: setting personal learning goals, demonstrating strengths, identifying areas needing improvement and most importantly, reflecting on learning. First, I will discuss the quantitative data gathered from the five-point Likert-scale questionnaire that addresses the first three aspects of learning and then, I will discuss the qualitative data gathered from my reflective journal, and student reflections that accompanied their artifacts and were a part of their showcase portfolios. This qualitative data addresses student reflection.

In the midterm questionnaire, the median responses to questions that addressed the theme of deep learning were all 4 (agreed) on a 5-point scale. Students agreed that electronic portfolios helped them demonstrate their strengths, identify areas needing improvement, set personal learning goals, and use feedback to support their work. The median response in response to the same questions in the final questionnaire remained at 4 on the 5-point scale. This finding suggests that electronic portfolios were supporting several aspects of deep learning. However, in the final questionnaire there was again a

negative sift towards uncertainty and disagreement. This shift was most apparent in the responses to the statement, *electronic portfolios have helped me demonstrate my strengths.* In the midterm questionnaire, 11 students agreed and one was uncertain with the first statement. In the final questionnaire only six students agreed with this statement, five were uncertain and one disagreed. This shift may be due in part to the limitations in the way we used Microsoft PowerPoint and the novelty effect.

The work that students completed and stored in the Microsoft PowerPoint program was only available for others to see if students were allowed the time to present it. Consequently, students may not have felt that they were able to demonstrate their strengths to an audience, as they would have liked. Both Avraamidou and Zembal-Saul (2002) and Barrett and Carney (2004) advocated using web-based programs like wikis and blogs to support students sharing their work. Use of either program may have given the students a better sense of showcasing their strengths. Later, I will discuss the use of wikis and blogs to also support student reflection.

Avraamidou and Zembal-Saul (2002) and Chetcuti (2007) noted in their studies that student reflections changed over time moving from being descriptive, telling what they did, to being explanatory, telling why they did what they did. I looked for my students' reflections to evolve in the same way.

Student reflections were guided by a self-evaluation form (see Appendix B). The first several reflections were very simple, brief and descriptive. Students wrote in their self-evaluations "I like the colour choice I made in this project and my use of pictures to support my written work." "I did not clutter this project with special effects. I used them

sparingly." When prompted to consider how they might make changes to their projects if they were to do them again responses were, "I can't think of anything I would change next time." As the course progressed the reflections remained descriptive but they also began to show more thought. One student wrote in her self-evaluation "...I...realize now that a powerpoint presentation would have been a better way to present this rather than an essay." Another student wrote

> I thought that I had done a good detailed job of discussing the similarities between Christian Ten Commandments and Buddha's teaching. When I read your (teacher) comments I realized I could have ...discussed how these commandments influenced the cultures of North America and India.

I wrote in my personal journal

> Writing reflective pieces that are descriptive is a simple process for students, moving beyond descriptive writing towards explanatory writing that analyzes and evaluates work is a difficult move for students to make. I need to provide better modeling of reflective writing and to change the self-evaluation form so that it better encourages analysis and evaluation of work.

Barrett (2007) suggested that there is a dual learning curve for teachers working with electronic portfolios for the first time. Teachers are learning how to use the technology to build the portfolios and they are learning how to use the electronic portfolios to support deep learning. This was certainly the case with me. I spent more time learning to use technology to build electronic portfolios than I did developing methods to support student reflection. Consequently, I never saw my students' reflections evolve beyond being descriptive.

One method of supporting student reflection suggested by Barrett and Carney (2004) is to develop strategies that help students treat their learning as stories to be told

and shared with others. Avraamidou and Zembal-Saul (2002) and Barrett (2004) suggested using blogs and wikis. Barrett pointed out that as these technologies are web based, their use may give students a sense of sharing their work with an audience. Additionally, students would be able to give and receive feedback on their work. Moreover, students would have other examples of reflective writing to model their reflections after. In other words, wikis and blogs could better support a dialogue among students that would support explanatory reflection. In my experience as a teacher, students would initially have to be required to participate in this dialogue and good models of feedback would have to be provided if this process were to support explanatory reflection.

In summary, my research asked, "can electronic portfolios support deep learning?". The quantitative and qualitative data suggested that they could. In the questionnaires, students indicated that portfolios supported them in demonstrating their strengths, setting personal learning goals, identifying areas needing improvement, and using feedback to improve their learning. My reflective journal, and student evaluations showed that although student reflections remained stuck at being descriptive, they did become more thoughtful and students were able to begin to see ways that they could improve upon their work. I suggested that I had not developed strategies for supporting a transition from descriptive reflections to explanatory reflections and that one strategy worth consideration is the use of blogs and wikis as mediums to build the portfolios and to encourage students to view their learning as stories to be told to others. As blogs and wikis are web-based, they may give students a better opportunity than PowerPoints to share their learning stories with others and to give and receive feedback. Finally, I noted

that if the feedback were to support explanatory reflection, teachers would have to provide models of good feedback.

Organization

There were two levels to organization. On one level, we had to have a system for storing assignments; on another level, we had to have a system for keeping the assignments themselves organized. I found that if these systems were in place and followed, electronic portfolios were easy to keep organized and, particularly for the two males in the study, the advantages became apparent. If these systems were not followed, then portfolios quickly became disorganized and offered no advantages over the binders students carried. First, I will discuss the quantitative data gathered and then, I will discuss the qualitative data under the theme of *organization*.

In the midterm survey, student response to organization provided by portfolios addressed the first level of organization and was positive. The median response to the question "Using electronic portfolios has helped me keep my work organized" was 4.5. Six students agreed and six strongly agreed with this statement. The response to the statement "Electronic portfolios have helped me take care of my work." was 4. Six students agreed, three strongly agreed and three were uncertain. In the final questionnaire the median response to both questions was 4. One student disagreed and one was uncertain with the statement "Electronic portfolios have helped me take care of my work".

Two more advantages to electronic portfolios appeared to be organization and storage of work. I can only speculate that the students who were uncertain or disagreed that electronic portfolios helped look after their work were students who lost their work, particularly at the beginning of the course, when we had so much difficulty saving student work. This speculation is supported by qualitative data I gathered in my reflective journal. I noted early on that "some of the working portfolios were taking the shape of my students' binders. Assignments were misplaced or lost, and students were wasting time looking for their work" (journal entry). One student discovered his work had not been saved and stated "I hate this. My work did not save, and I have lost everything I did." (journal).

The problems we encountered at the start of the course existed because we did not have a reliable method for storing student work; work could not be saved on the school server and saving work to discs was unreliable because many computer disc drives did not work. Initially, our most reliable method for saving work was to email it to ourselves. If students forgot to do this, or did not attach their work properly, they lost it.

Once we had thumbdrives, organization became much more straightforward. Storing work was particularly significant for the males in my class who noted their thumbdrives still became messy, but as one student noted, his thumbdrive was easier to "clean-up" and re-organize than his binder.

The second level of organization became apparent within the documents themselves. As students learned more about using the features of Microsoft PowerPoint their electronic assignments quickly became disorganized with special effects. I noted in

my journal that, "As students become confident using Microsoft PowerPoint, their assignments become cluttered with fancy fonts, pictures and special effects. It is frustrating to try to read and navigate through their work." Time had to be spent teaching students how they might use the features available in Microsoft PowerPoint to streamline and support their presentations rather than make their work cluttered and appear disorganized. Working with students to help them organize their documents came up again under the theme of *Assessment.*

To summarize, work by Brown (2002), Wetzel and Strudler (2006), and van Wesel and Prop (2008) highlighted an advantage of electronic portfolios as helping students to organize their thoughts and ideas before they wrote them down on paper. My study stressed the advantages of organization at a much more basic level. Electronic portfolios supported organization of the documents themselves. First, electronic portfolios helped my students keep their documents safe from being lost, ripped or damaged. Second, electronic portfolios supported my students keeping the documents themselves organized. One explanation for the different levels of organization between previous studies and my study may be that previous studies focused on college and university students who may have been less likely to lose or have their work destroyed and more focused on what they were going to put on paper, while my study focused on high school students for whom, lost or ripped work and presentation of work were still a concern.

Motivation

Motivation refers to students' continuing to use electronic portfolios on their own, free of the insistence of teachers and the requirements for marks. Tosh et. al (2005) noted that motivation in the classroom requires a strong sense of how the task meets the egocentric needs of the student. Students need to be able to identify added value to be motivated to use electronic portfolios. Additionally, Kember, Ho, and Hong (2008) stated that to motivate learning relevance of the topic must be established, and one way to do this is to demonstrate how learning can be applied in everyday life. Students need to see how their learning can be used outside of the classroom.

Both the quantitative and qualitative data suggested that students identified added value of electronic portfolios and were consequently motivated to use them in the classroom. However, motivation to use the electronic portfolios did decline throughout the semester. I suggest that relevance of electronic portfolios to everyday life may not have been established for my students, consequently the novelty of the activity played a role in motivational decline. The following section will outline some specific findings related to the profession literature.

First, I will discuss the data generated from the five-point Likert-scale questionnaire and then I will discuss the quantitative data. The median response to questions like "electronic portfolios have helped me remain interested in my work and to share my work with others; and I will continue to use electronic portfolios" was 4 in the mid-term survey and apart from the final response, remained 4 in the final survey. To the final response, "I will continue to use electronic portfolios" the median response dropped

from 4 to 3.5. Furthermore, six of the 12 students indicated that they were undecided as to whether they would use electronic portfolios again. This response was one of the most negative to electronic portfolios I encountered.

The median responses suggested that students found the value in electronic portfolios in helping them to remain interested in their work and helped them to share their work with others. Consequently, students were motivated to use electronic portfolios in the classroom. However, despite the apparent value of portfolios in the classroom, half the students indicated that they might not use them again. Relevance of the electronic portfolios in the student's everyday lives may not have been established. This relevance becomes more apparent under the theme of *Buy-in*.

Qualitative data were collected through my reflective journal entries and interviews. I noted that at the start of the course students appeared motivated to use electronic portfolios. They were taking ownership of their work. They arrived to class on time. They asked to take their thumbdrives home so they could continue to work on their portfolios. Students indicated in interviews that they liked their portfolios because they allowed them to share their work with others and to be creative. It appeared that another advantage to using electronic portfolios was motivation. However; towards the end of the course, the qualitative data showed motivation to use portfolios was waning. Some students indicated that they felt they were spending too much time on their portfolios and that the Microsoft PowerPoint program was now limiting their opportunity to be creative. I recorded in my journal,

> Students have said they were tired of working on the electronic portfolios...Others, that they believed they were spending too much time on the portfolios...When asked if they could see themselves using portfolios in other courses, many said they could not.

This finding supports what Fiedler and Kaner (2007) and Tosh et al. found in their respective studies as they reported that students need to be challenged as they become more empowered with their skills.

Fiedler and Kaner's (2007) study highlighted some tensions related to electronic portfolios which included that students felt limited by the portfolio program they were using and that they were spending too much time on the portfolios. Additionally, students saw little use for portfolios in their future. Tosh et al. suggested in their study that students wanted structured systems at the start of the program, but as they became more experienced with the programs and their portfolios they wanted less structured systems. This could also have been the case in my study. Students may have become less motivated to work on their portfolios because they felt limited by Microsoft PowerPoint (some students did go on to use wikis for their portfolios). Motivation may also have declined because students saw no purpose for electronic portfolios outside of the course. Relevance of the portfolios was not established. This concept will be discussed further under the theme of *Buy-in,* but relevance also plays a role in creating a novelty effect.

The novelty effect is an effect that has not been mentioned in any of the previous studies I previewed; yet I think it was a very real effect in this study and deserves some exploration in addressing the decline in motivation. The novelty effect occurs when new technology is perceived as an exciting, favourable alternative to existing technology

(Wells, Campbell, Valacich, & Featherman, 2010). I suggest that electronic portfolios were perceived as exciting new options for completion of course requirements and therefore students initially held favourable perceptions of the portfolios.

These perceptions shift over time and are influenced by perceived benefits to using this technology (Goode, 2010). The benefits of electronic portfolios were apparent in my class. Students appreciated the ease with which they could edit their work, keep their work organized and complete the course requirements. They had difficulty seeing the benefits to using electronic portfolios outside of my class and consequently their motivation to continue using electronic portfolios may have diminished from a median response of 4 to 3.5.

In sum, the theme *Motivation* focuses specifically on students continuing to use electronic portfolios on their own. In this study, students initially appeared motivated to use electronic portfolios and motivation appeared to be another advantage to using electronic portfolios. However, motivation declined over time. I suggested motivation declined for two reasons. First, students began to feel limited by Microsoft PowerPoint. Second, students could not see how they might continue use electronic portfolios, consequently the novelty of portfolios wore off and motivation declined. This finding suggests that electronic portfolios had not been well promoted or well supported by me and by other teachers.

Assessment

The following section will address a significant part of my research question, "can electronic portfolios be used to support the teacher's need for assessment and the

student's need for deep learning?" First I will discuss how the electronic portfolios were assessed and then, I will discuss the qualitative results gathered that address summative assessment and formative assessment.

Students created work that met the prescribed learning outcomes outlined in the British Columbia Ministry of Education's Resource Package. This work was assessed formatively and summatively by both me and the students using rubrics (see Appendix B). The rubric and work were then stored in a working portfolio. From this working portfolio, students selected four examples of their best work to present in show case portfolios. The showcase portfolios were also assessed summatively.

I had one significant concern about summative assessment of the portfolios; namely, that much of what I had read (e.g., Barrett, 2005; Hicks et al, 2007; McMullan et al, 2003; Tosh et al., 2005) argued that summative assessment caused students to view portfolios as nothing more than assignments to be completed for marks. Honest reflection and student ownership – key ingredients for supporting deep learning – were squelched by summative assessment. Yet summative assessment was necessary for my reporting purposes and it provided incentive (albeit extrinsic) for completing the portfolios. I wrote in my journal, "I know that portfolios support summative assessment. The projects are like any other projects and are evaluated in the same way... students have final marks and I have marks for reporting purposes." Additionally, I had students who were concerned about the summative assessment of their work. They asked how the assignments were to be marked, and if they could see their marks. One student said of the show case portfolio "...I would not have done a show case portfolio if were not for

marks" (interview). Despite several current studies suggesting that summative assessment had a deleterious effect on student reflection and ownership of work, summative assessment was important in the minds of my students and necessary for reporting purposes. However, I discovered, as did the students, that through the use of portfolios, summative evaluation could take on a new role. Rather than being a final evaluation of student work, it could also be used to support student learning.

Once assignments received final marks, they were stored in the students' working portfolios, easily accessible for future reference. Throughout the course I referred students back to their completed assignments, and reviewed the process I used to evaluate their work. Students commented in interviews "I liked the fact that it was easy to look back on past assignments and use those assignments as examples to follow." In this way, summative assessment took on a different meaning for the students. Rather than being only a final measure of their work, summative assessment became a tool that students could use to support further learning and growth. This appeared to lessen the emotional impact of summative assessment. Barrett and Wilkerson (2004) and Chetcuti, Murphy, and Grima (2006) suggested that summative assessment might be used in this way. I found that electronic portfolios provided a straightforward and rewarding way for both me and the students to use summative assessment not only as a means to generate final marks but also to support further learning.

Barrett (2006), Chetcuti et al. (2006), and Stiggins (2002) stated that formative assessment required students be involved in a dialogue with the teacher that continues throughout the course. This dialogue reviews student work to support reflection, self-

assessment, and to provide guidance about how to improve future work. I found electronic portfolios supported this dialogue from the very beginning of the course.

On the first day of the semester I handed out a course outline that explained students would be building electronic portfolios. Immediately I had students asking what electronic portfolios were and asking to see examples. The next day I began a discussion about electronic portfolios, explaining what they were and showing students how they were to be used. This discussion was unique in my teaching experience. Usually students accept the course outline without question. Now we were discussing why we were using electronic portfolios. I was explaining what they looked like and the criteria by which they were to be assessed. As the course progressed I noted that electronic portfolios continued to support discussions with students.

These discussions centered on reviewing work with the students to improve learning. And the wonderful aspect of these discussions was that they were not emotionally threatening. I was able to sit down with students one-on-one. Together we went through their assignments with the assessment rubrics in hand, discussed the assessment criteria, and because of the electronic aspect of the portfolios, we easily reviewed past work and made immediate changes to their present work. One student wrote " I like that I can talk to you (the teacher) about how to make my work better and then make the changes quickly and easily." Another student wrote " I liked having past work readily available...as a record of improvements" In the past this type of assessment has been one-sided and emotional for both the students and me. It is one-sided and emotional for the students because they do not want to discuss changes to their work;

making changes suggests they have to start all over again. I have had students throw their work away and give up. I find this assessment emotional because I know it will be difficult for students to see how my feedback would improve their work, and I know that students often will give up.

To summarize, I asked "Can electronic portfolios support the teacher's need for assessment and the student's need for deep learning?" I found that electronic portfolios easily supported summative assessment and made formative assessment a powerful tool for supporting student learning. Summative assessment was done in the same way that I have always summatively assessed student work. I had marks for reporting purposes. What electronic portfolios did was to change the way summative assessment was used by both the students and me. Summative assessment became a tool that we could use to support future learning. Students could refer back to completed assignments and use the assessment to improve future assignments. Electronic portfolios helped formative assessment become a powerful tool for supporting student learning because the portfolios supported open unemotional dialogue between the students and me about how to make their work better. In this way electronic portfolios also supported deep learning.

Buy –In

While motivation focused on the students' desires to use electronic portfolios, *buy-in* focused on my ability to develop that desire. In other words, *buy-in* was about promoting the electronic portfolios to students in such a way that they appeared fun, helpful, and, most importantly, as tools that students would choose to use to support their learning. To promote electronic portfolios effectively, researchers (e.g., Barrett, 2005;

Hicks, Russo, Autry, Garden, Kobedin, & Edington, 2007; Tosh et. al., 2005) have all suggested that examples of good electronic portfolios must be given. These examples should show how electronic portfolios can be used to support learning and growth in and out of school. Without adequate promotion electronic portfolios may be nothing more than assignments completed for marks, and as I mentioned earlier, motivation to develop the portfolios will decline.

The qualitative data that I gathered highlighted these ideas. I had written in my journal,

> Barrett suggested having examples of portfolios to show students if they are to buy-into the idea of using electronic portfolios, but this is my first time working with portfolios and I do not have any examples. All I have are marks assigned to the portfolio.

At the end of the course I asked students if they could think of other courses in which they might use portfolios. The common responses were "no" and "Teachers would have to offer portfolios as an option." Further, in interviews, students stated that they did not understand how they could use portfolios in other courses and that they would have liked to have seen examples of completed portfolios. Students suggested that these examples could come from members of their community and from me, their teacher. Clearly, I had not promoted electronic portfolios in such a way that students could understand how portfolios might support future learning.

To summarize, if the portfolios were to be effectively promoted to my students, two concepts needed to be developed. First, students needed to understand how they could use portfolios in their other school courses. More teachers promoting electronic portfolios would clearly support buy-in. Second, examples of completed portfolios

needed to be shown. These examples should have come from me, and if possible, from other professionals in the community. There were no other teachers using portfolios at my school and I had no examples of completed portfolios. All I had to promote the portfolios was assessment.

Chapter Summary

My research question examined the extent to which electronic portfolios were effective classroom tools for supporting deep learning and assessment. Additionally, my research asked, "what are the advantages and disadvantages to using electronic portfolios and do the advantages outweigh the disadvantages?" In addressing these questions, quantitative data was gathered from midterm and course end surveys and qualitative data was gathered throughout the semester in the form of interviews, a reflective journal and student written responses. This chapter discussed the results of the data under the themes: of *technology, deep learning, organization, motivation, assessment,* and *buy-in.*

I found that the advantages and disadvantages to electronic portfolios began with technology. I suggested that the advantage of being able to easily make changes to work was realized for the student, while the disadvantages of needing access to reliable computers, technical support, and a system for building and storing the portfolios existed for the teacher. These disadvantages could be exacerbated for the teacher by a lack of experience with technology and by a lack of a community of support within the school. However, I concluded by noting that the advantages outweighed the disadvantages. This became apparent under the remaining themes.

The second part of my research question asked, "can electronic portfolios support the student's need for deep learning?" My data suggested that the electronic portfolios did support deep learning. My quantitative data showed that electronic portfolios helped students set personal learning goals, demonstrate strengths, and identify areas needing improvement. My qualitative data indicated that electronic portfolios also, and perhaps most importantly, supported reflection on learning. My students' reflections showed increasing thoughtfulness throughout the course, but they remained descriptive, never progressing towards being explanatory reflections. I agreed with Barrett and Carney (2004) that one strategy to support reflective writing is to encourage students to view their learning as stories to be shared with others. I think that our use of Microsoft PowerPoints to build and present electronic portfolios limited the students' opportunity to share their work with others. The use web based programs like wikis and blogs to build the portfolios could better support the sharing of work and reflective writing. This idea of will be pursued further in Chapter 6.

Under the theme of organization, I noted that without a reliable system for storing student work, electronic portfolios were no better than my students' binders. Their work could be easily misplaced or entirely lost. Once we had settled on using thumbdrives to store the portfolios, organization became another advantage to electronic portfolios. The median responses to questions concerning organization on the midterm and final questionnaires remained positive. Students, particularly the two males in the course, felt that electronic portfolios helped them take care of their work.

Motivation referred to students continuing to use electronic portfolios on their own. I suggested that if this were to happen, students had to see how electronic portfolios could be used to support their learning in future courses. The quantitative data from the midterm and final questionnaire suggested that students were motivated to use the portfolios in the classroom. However, one of the most negative responses on the questionnaire was to the statement "I will continue to use electronic portfolio". To this statement six of the 12 students were undecided. Furthermore, my qualitative data also indicated that many students said they would not continue to use electronic portfolios in other courses. I suggested that the novelty of the electronic portfolios had worn off and that the portfolios had not been well promoted or supported by me and by other teachers.

I asked "can electronic portfolios support the teacher's need for assessment?" The short answer is yes. Electronic portfolios support summative assessment. Moreover, I found that electronic portfolios changed the way the students and I used summative assessment. We began to use summative assessment to support student learning. Additionally, electronic portfolios supported formative assessment. I found that one of the great strengths of electronic portfolios was that they supported open, unemotional dialogue between the students and me about how to make their work better.

The theme of buy-in addressed my ability to develop the student's desire to use electronic portfolios. Students stated in interviews that they could not see how they might use electronic portfolios to support their learning in other classes and that they would have liked to see examples of portfolios from me and possibly other members of the community. Much of the research also indicated that if I were to develop the

students' desire to use electronic portfolios, I should have examples of good electronic portfolios to show them. As this was my first time using electronic portfolios I had no examples to show my class. All I had to promote the portfolios was assessment.

CHAPTER SIX: CONCLUSION

Chapter 1 introduced the research problem and the research questions, which examined the extent to which electronic portfolios were effective classroom tools for supporting deep learning and assessment. Chapter 2 surveyed the research on the use of electronic portfolios to support deep learning and assessment. Chapter 3 outlined the research methodology, discussed the action research, and concluded with an overview of research tools. Chapter 4 outlined the qualitative and quantitative data that were collected during the course of the research. Chapter 5 discussed the findings derived during the data collection phase of this study. Chapter 6 begins with a review of the purpose of the current study including questions that were the focus of the research. The implications of this study and recommendations for future research and concluding remarks complete this chapter.

Review of Purpose

The intent of this study was to examine how qualitative assessment in the form of electronic portfolios could be conducted to engage students in their learning. Furthermore, it was proposed that students, through the use of electronic portfolios, would gain knowledge and experience that they would carry with them into following years to support their learning. The main question that guided this research was, "Can electronic portfolios support the teacher's need for assessment and the student's need for deep learning?" Additional questions asked, "What are the advantages and disadvantages of electronic portfolios and do the advantages outweigh the disadvantages?"

Electronic Portfolios to Support Assessment and Deep Learning

The results of the current study confirm previous findings; namely that electronic portfolios support the teacher's need for assessment and the student's need for deep learning (for example, Avraamidou & Zembal Saul, 2002; Barrette, 2007; Chetcuti, 2007; Stansberry & Kymes, 2007). However, whereas much of the previous research was conducted by researchers external to the classroom and focused on post-secondary students (Checuti et al. 2006; Fiedler & Kanner, 2004; Tosh et al. 2009), the current study, which was based on action research, employed both quantitative and qualitative research methods and focused on high school students.

The quantitative and qualitative data provided ample evidence that electronic portfolios can be used to support both assessment and deep learning. Of particular significance in this study was the finding that electronic portfolios encouraged using summative assessment to support further student learning and encouraged discussions between the students and the teacher that supported formative assessment and were not emotionally threatening. Additionally, data also provided evidence that highlighted the advantages and disadvantages of using electronic portfolios in the classrooms. Advantages were that students improved their ability to use technology, were able to keep their work organized, and were motivated to complete their assignments. They were able to set goals, identify areas needing improvements and use feedback to improve their learning. Disadvantages were that as the teacher, I had to ensure that the students had access to reliable computers, something that was not always easy to ensure or control. I

had to be competent in my ability to use the technology. I also had to develop strategies that supported students' abilities to reflect on their work.

Research and Educational Implications

This study adds to the current literature by demonstrating that electronic portfolios can support both assessment and deep learning as suggested (Barrett, 2005). It also extends the action research conducted by high school teachers and highlights my experiences developing electronic portfolios; additionally this study presents implications of portfolio use for educators and researchers alike.

For researchers, the implications are theoretical and methodological. The theoretical implications are that electronic portfolios can be powerful tools for supporting both assessment and deep learning. The professional literature suggested that if deep learning is to be supported, opportunities for self-reflection, for sharing work, and for students giving commentary on each another's work need to be provided.

My research found that electronic portfolios can provide these opportunities. The methodological implications suggest that in order to support both assessment and deep learning, a system of portfolios needs to be in place. This system would consist of a working portfolio where assignments are stored and a show case portfolio where a student's best work is displayed for others to view and comment on. Moreover, my research suggests that unless teachers know how to post PowerPoint presentations onto the web, web-based programs such as wikis would be more effective than Microsoft PowerPoint for displaying student work. Furthermore, to promote electronic portfolios effectively, a teacher needs to have exemplars of completed portfolios to show students.

For educators, the implications are pedagogical. First, I found that assessment practices improved. As a teacher, I began to use summative assessment to support student learning and was able to effectively use formative assessment to guide student learning. Additionally, self-assessment practices became a reality for students. Second, electronic portfolios supported students keeping their work organized. Third, students were motivated to work on, complete, and share their assignments. Educators do need to develop competence using technology such as PowerPoints and wikis and blogs and they must be prepared to take the time to teach their students how use this technology. Additionally, educators must have adequate access to technology and technical support for implementing portfolios. Moreover, educators need to foster a community of practice among fellow staff and administration. Finally, educators must be prepared to teach students the skills necessary for deep learning such as reflective writing and giving supportive feedback.

Recommendations for Further Research

While the current study investigated the use of electronic portfolios with high school students, there are several directions for further investigation. First, this study used Microsoft PowerPoint to build and maintain the electronic portfolios. I found several limitations to using this program; namely, that it limited the opportunity for students to share their work with others and thereby limited the opportunity for students to support one another through collaboration and comments. The use of web-based programs like wikis and blogs to create and maintain electronic portfolios might better support students sharing their learning with others.

In this study, I was the only teacher in my school using electronic portfolios. A further second consideration for future investigation would be to have a group of teachers in the same school use electronic portfolios. Barrett (2007) called this situation a community of practice. There are several possible advantages to having this community of practice. A group of teachers could better solve technological problems, share ideas for developing the portfolios and perhaps most importantly, and demonstrate to students how electronic portfolios could be used to support their learning in a variety of courses.

A third direction for future research could be research that is longitudinal in its approach, taking students at Grade 8 and following them through to Grade 10, or taking students at Grade 11 and following them through to the end of Grade 12. Such an approach could support research in two ways. First, it would allow researchers to determine if students had developed an understanding of how electronic portfolios could support their future learning and if they had a desire to continue using electronic portfolios. Second, a longitudinal approach would also support researchers tracking changes to students' reflective writing. Researchers could see a change from descriptive reflection to explanatory reflection.

Concluding Remarks

I feel confident, that as a researcher, I will continue to do action research and as a teacher, I will continue to use electronic portfolios to support assessment and deep learning in my classroom. While there are many technical and pedagogical challenges to implementing electronic portfolios in the classroom, continually working to address these challenges is paramount to better teaching practice. The answer to my initial question

"Can electronic portfolios be used to support assessment and deep learning?" is that they can be used effectively to support both summative and formative assessment as well as deep learning.

As demonstrated by my research, electronic portfolios easily support summative assessment, but more importantly, through the use of electronic portfolios summative assessment can be used to support future learning. Additionally electronic portfolios support formative assessment by encouraging dialogue between the student and teacher that focuses on improving student work and is not emotionally threatening. Electronic portfolios support deep learning by allowing students to demonstrate their strengths, set personal learning goals, identify areas needing improvement, and use feedback to improve their learning. These advantages outweighed the disadvantages encountered in the use of technology at my school.

My research has direct implications for policy makers since it demonstrates the need to support and develop the use of technology in education. In particular, this support and development would include better provision of technological support for schools and professional development for teachers. It also highlights the electronic portfolios' capacity to support assessment and student learning. In conducting the research, I learned the importance of reflection and self-reflection and how these forms of reflection informed my practice. Professional development and discussion related to the use of assessment and reflection to support learning needs in school districts.

In sum, teaching staff and community members are concerned about the lack of engagement and achievement among the students at my school. This thesis studied how

electronic portfolios can be used to support student engagement and learning and the teacher's need for assessment. This study provides evidence that electronic portfolios can have a significant role in education.

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Appendix A

Date: _____

Likert Scale Questionnaire.

Directions: Please choose one of the following answers to the statement by circling the response (SD=strongly disagree D = disagree U = undecided A = agree SA = Strongly agree)

1. Using electronic portfolios has helped me to

Keep my work organized	SD	D	U	A	SA
Take care of my work	SD	D	U	A	SA
Be creative in completing my work	SD	D	U	A	SA
Remain interested in my work	SD	D	U	A	SA
Share my work to others	SD	D	U	A	SA
Identify areas needing improvement	SD	D	U	A	SA
Demonstrate my strengths	SD	D	U	A	SA
Set some personal learning goals	SD	D	U	A	SA
Use feedback to improve my work	SD	D	U	A	SA
Make changes to my work	SD	D	U	A	SA
Work with other students	SD	D	U	A	SA
Be motivated to learn	SD	D	U	A	SA
Improve my ability to use technology	SD	D	U	A	SA
Think more about my own learning	SD	D	U	A	SA

2. My electronic portfolio

Has been easy to use	SD	D	U	A	SA
Taken up too much time in class	SD	D	U	A	SA
Given me the space I need to store all my work	SD	D	U	A	SA
Has been a useful tool for supporting my learning.	SD	D	U	A	SA
Is a tool that I will continue to use in other classes	SD	D	U	A	SA

3. Do you have access to a computer at home? Yes No

4. Do you have high speed internet at home? Yes No

5. Would you make use of electronic portfolios in other classes if you were given the opportunity?

Yes No

6. Can you think of other courses where electronic portfolios might be useful?
Yes No

7. Describe what you liked about using electronic portfolios

8. Describe what you did not like about using electronic portfolios

9. List any other way that we might use electronic portfolios to support your learning during the final month of Comparative Civilizations?

Appendix B

Student Self-Evaluation

Rubric for Self-Evaluation
1. I worked in a disciplined way all the time some of the time rarely Evidence: _____
2. Work is organized and easy to navigate. all the time some of the time rarely Evidence: _____
3. Answers indicate thoughtfulness. all the time some of the time rarely Evidence:_____ _
4. Was able to apply learning to present day situations. all the time some of the time rarely Evidence: _____

Appendix C

Information Letter

Dear Student and Parent/Guardian

As a member of the Western Civilizations 11/12 class _____ has an opportunity to participate in a thesis project.

As the teacher, I will be conducting a study into the use of electronic portfolios for students. The purpose is to find out if building electronic portfolios will support deep student learning and the teacher's need for assessment, by engaging students in their work and giving students a sense of ownership of their work.

Students will use a program entitled Microsoft Office FrontPage. The portfolios will be used to hold several artefacts that students will have created as assignments in class. These artefacts will have been selected by the students as evidence of their meeting the learning outcomes of the course. Students will assess their work through self evaluations and reflections. The teacher will collect data throughout the course, in the form of field notes, interviews with students, and questionnaires that contain open ended and closed Likert – type scale questions. All data will be stored on portable USB devices. Only the student and teacher will have access to the portfolio.

Student participation is voluntary. There are no consequences if a student does not participate and a student may withdraw from the study at anytime. At the end of the course the student may keep the work or erase it. In completing the study no names will be used. All data will remain anonymous.

If you have any questions about electronic portfolios, or any questions about this study please contact me by phone at (250)-842-5214 or by email at mark.newbery@cmsd.bc.ca. I will be happy to share my findings with you privately or during a parent/teacher night. If you have any concerns or complaints about the study that you wish to direct to the University of Northern British Columbia please contact the Office of Research by phone at (250)-960-5650 or by email at reb@unbc.ca

I am excited about this new learning opportunity and hope that students who participate will also be excited and successful using this learning tool.

In order for a student to participate the accompanying consent form must be signed by both the student and the parent/guardian.

Thank you for considering this learning opportunity

Mark Newbery

Appendix D

Informed Consent Form

Parent/Guardian Consent Form

I understand that Mark Newbery, who is a graduate student in Education at the University of Northern British Columbia, is conducting a research study on electronic portfolios as part of his Master of Education degree. The purpose of the research study is to find out if building electronic portfolios will support deep student learning and the teacher's need for assessment, by engaging students in their work and giving students a sense of ownership of their work. The study will be conducted at Hazelton Secondary School during Western Civilizations 11/12 classtime.

I understand that my son/daughter was chosen as a participant in this study because he/she is in the class. I also understand that Mr. Newbery will be assessing the student's work to use in his analysis. Information from this study will be used to enhance future teaching and support the professional literature.

1. Consent for the inclusion of my son's/daughter's data is given on the understanding that Mr. Newbery will use his best efforts to guarantee that my son's/daughter's identity will be protected and his/her confidentiality maintained both directly and indirectly.
2. I understand that participation in the study is completely voluntary and that my son/daughter may choose to withdraw or I may choose to have my son/daughter withdrawn from the study at any time without penalty. If my son/daughter is withdrawn from the study, his/her information will be withdrawn automatically as well.
3. I understand that the data to be collected will be at Hazelton Secondary School during in-class time.
4. I understand that my son's/daughter's responses may be audio recorded.
5. I understand that the data collected will not be used in any way for the purposes of my son's/daughter's report card.
6. I understand that the data collected will be treated in the following manner:
    a. The data will be stored in a secured filing cabinet or computer at Mr. Newbery's private residence or in a secured filing cabinet or computer at Hazelton Secondary School.
    b. The data will be used only by Mr. Newbery, and only for his MEd thesis or presentation at learned conferences or published in learned journals and books.
    c. The data will be shredded or deleted at the end of the study by Mr. Newbery or I may have the data returned to me in April 2011.
7. I understand that if I have any comments or concerns that I may contact Mr. Newbery at 250-842-5214, Dr. Andrew Kitchenham at 250-960-6707, or the Office of Research, UNBC at 250-960-5820.

Student name _____

Date_____

I am willing to participate in the study of the use of electronic portfolios in Western Civilizations 11/12.

Student signature _____

I am willing to have _____ participate in the study.

Parent/Guardian signature

_____